PB83-187450

Organic Compounds in Surface Sediments and Oyster Tissues from the Chesapeake Bay. Appendices

Virginia Inst. of Marine Science
Gloucester Point

Prepared for

Environmental Protection Agency
Annapolis, MD

Apr 83

U.S. Department of Commerce
National Technical Information Service
NTIS

PB83-187450

EPA-600/3-83-018b
April 1983

ORGANIC COMPOUNDS IN SURFACE SEDIMENTS AND OYSTER TISSUES FROM THE CHESAPEAKE BAY

Appendices

by

R. H. Bieri, P. DeFur, R. J. Huggett, W. MacIntyre,
P. Shou, C. L. Smith, and C. W. Su

Virginia Institute of Marine Science
and School of Marine Science,
College of William and Mary
Gloucester Point, Virginia 23062

Grant
R806012

Project Officer

Duane Wilding
Chesapeake Bay Program
2083 West St., Suite 5G
Annapolis, MD 21401

CHESAPEAKE BAY PROGRAM
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
ANNAPOLIS, MD 21401

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA-600/3-83-018b	2.	3. RECIPIENT'S ACCESSION NO. PB83 187450
4. TITLE AND SUBTITLE Organic Compounds in Surface Sediments and Oyster Tissues from Chesapeake Bay Appendices		5. REPORT DATE April 1983 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) R. H. Bieri, P. deFur, R. J. Huggett, W. MacIntyre, P. Shou, C. L. Smith and C. W. Su		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Virginia Institute of Marine Science and School of Marine Science College of William and Mary Gloucester Point, Virginia 23062		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO. R806012
12. SPONSORING AGENCY NAME AND ADDRESS Chesapeake Bay Program U.S. Environmental Protection Agency 2083 West Street, Suite 5-G Annapolis, Maryland 21401		13. TYPE OF REPORT AND PERIOD COVERED 14. SPONSORING AGENCY CODE EPA/600/05

15. SUPPLEMENTARY NOTES

16. ABSTRACT

Detailed in the first part of this report is a development and discussion of the methodology used to extract and analyze sediment and oyster tissue samples from Chesapeake Bay for organic compounds. The method includes extraction, fractionation, and subsequent analysis using glass capillary gas chromotography and glass capillary gas chromotography - mass spectrometry. An extensive list of the mass spectral data and related information is contained in the appendices. The complete bank of processed data is also available on computer tapes at the Virginia Institute of Marine Science and at the Environmental Protection Agency's Chesapeake Bay Program. Also included in this report are the results of volatile halogenated organic compounds determined in water collected near the outfalls of several chlorine-using facilities, as well as from river mouths. The distributions of the total, and a few specific, organic compounds within the Bay are presented in histograms. Analyses clearly show that unsubstituted polynuclear aromatic hydrocarbons are the most prominent toxic pollutants in the Bay. The application of two different search routines, one concentrating on compounds at levels greater than 50 ppb and the other on temporal changes, allows a quick determination of where problem areas may exist and where additional investigation may be indicated.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group

18. DISTRIBUTION STATEMENT Unrestricted distribution	19. SECURITY CLASS *(This Report)* Unclassified	21. NO. OF PAGES 285
	20. SECURITY CLASS *(This page)* Unclassified	22. PRICE

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

DISCLAIMER

The information in this document has been funded wholly or in part by the United States Environmental Protection Agency under Grant No. R806012 to College of William and Mary, Annapolis, Maryland. It has been subject to the Agency's peer and administrative review, and it has been approved for publication as an EPA document. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

PART III

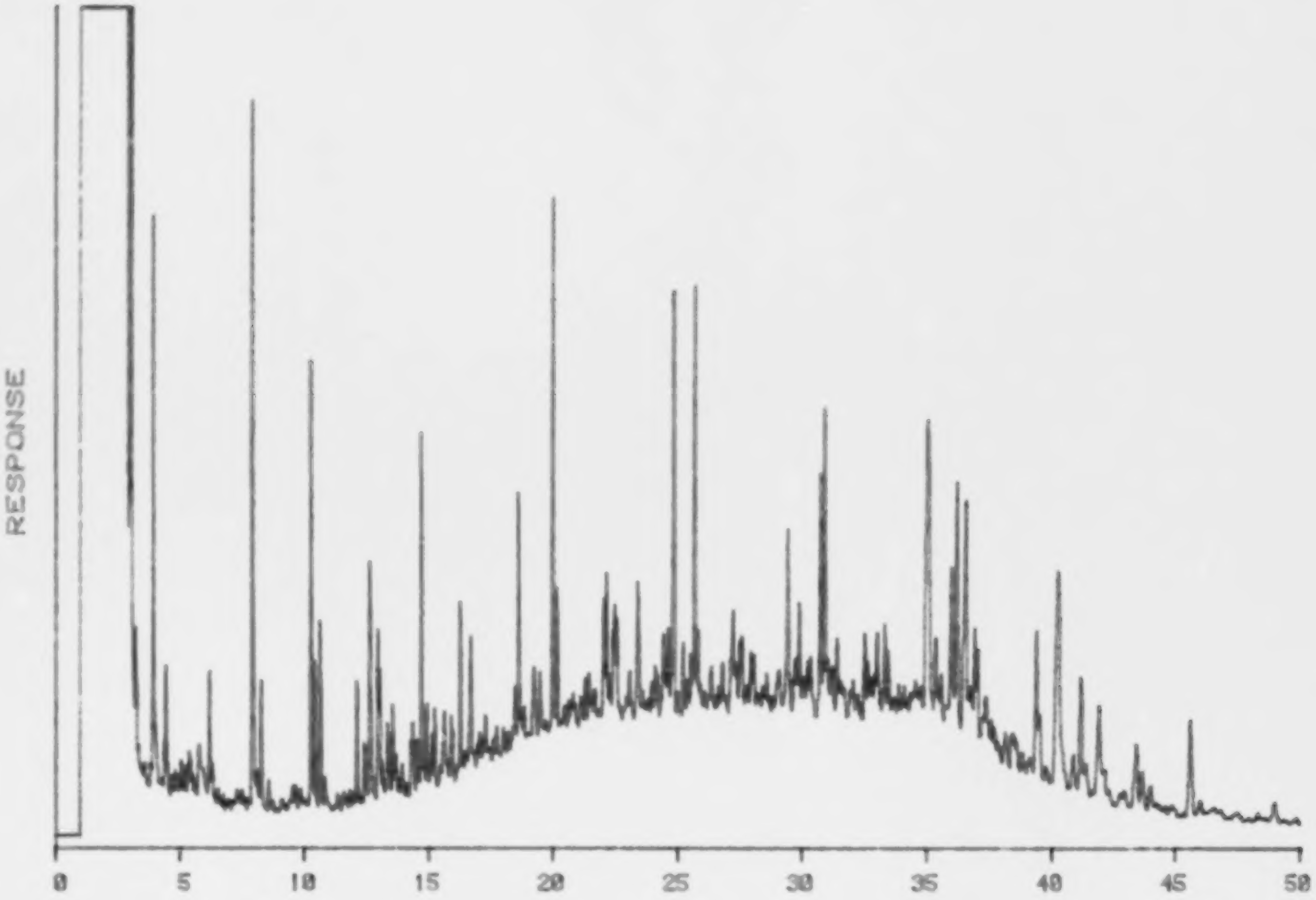
LIST OF APPENDICES

Appendix		Color
I	Complete data set for sediment samples from Station 23 (fall 1979)	Gray
II	Examples of computer reconstructed chromatograms for G3.1 fractions	Blue
III	Bar graphs for sediment samples	Red
IV	Search for compounds > 50 ppb in sediments (spring and fall)	Yellow
V	Search for temporal changes between spring and fall in sediments	Green
VI	Search for compounds > 50 ppb in oyster tissue (spring and fall)	Rust
VII	Search for temporal changes between spring and fall in oyster tissue......................	Orange
VIII	Determination of volatile halogenated organic compounds in the water column	Olive

APPENDIX I

Complete data set for sediment samples from Station 23 (fall 1979).

Computer reconstructed FID gas chromatogram of G3 fraction with 1,1-binaphthyl co-injected as quantitative standard. The response is normalized to the highest peak. Retention time is plotted on x-axis.



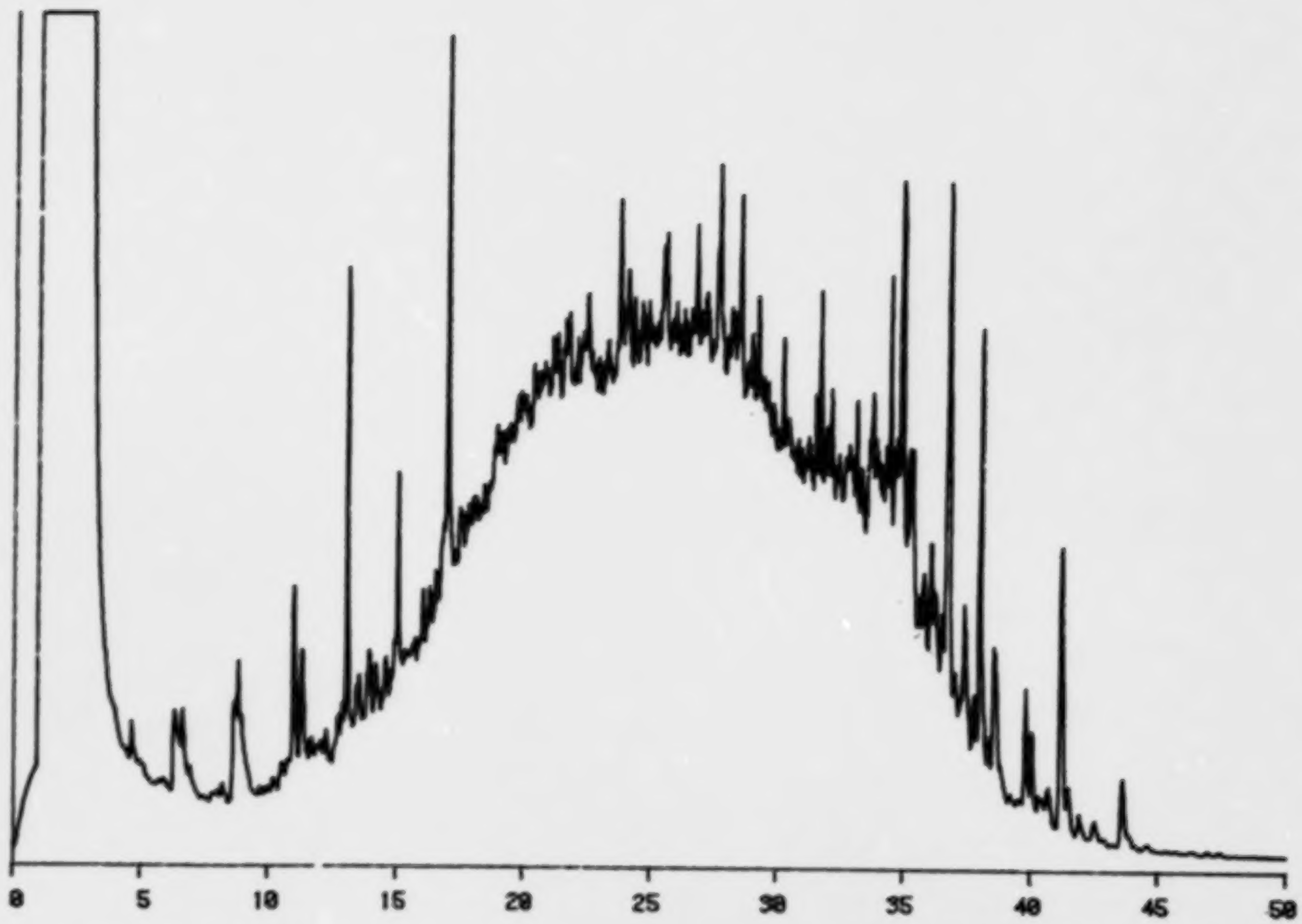
SAMPLE: 2-23S 63+BI

RAW FILE: S223F

SCALE FACTOR: .004

PLOT SPEED: 2

Computer reconstructed FID chromatogram of G3.1 fraction with 1,1'-binaphthyl co-injected as quantitative standard.

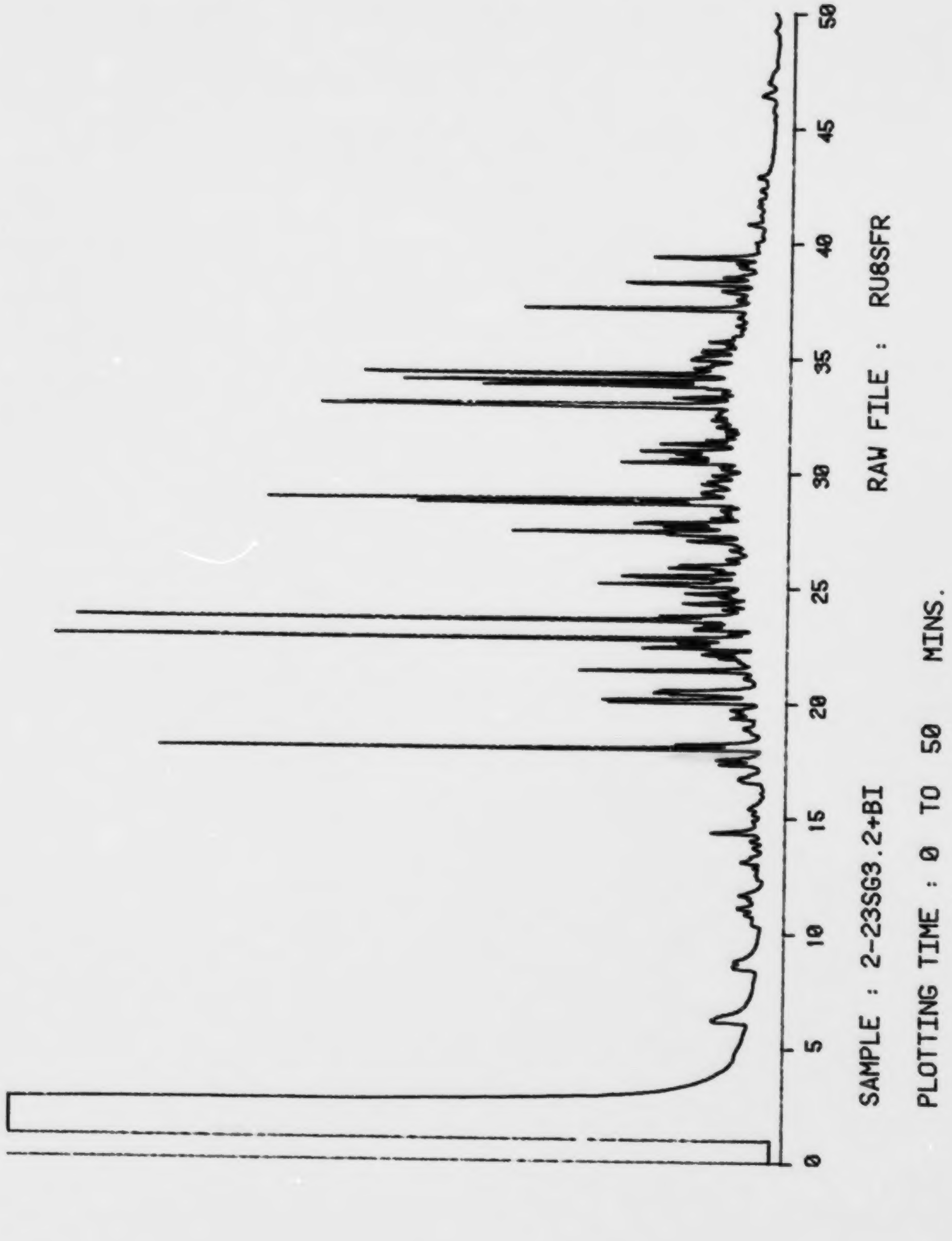


SAMPLE : 2-23SG3.1+BI

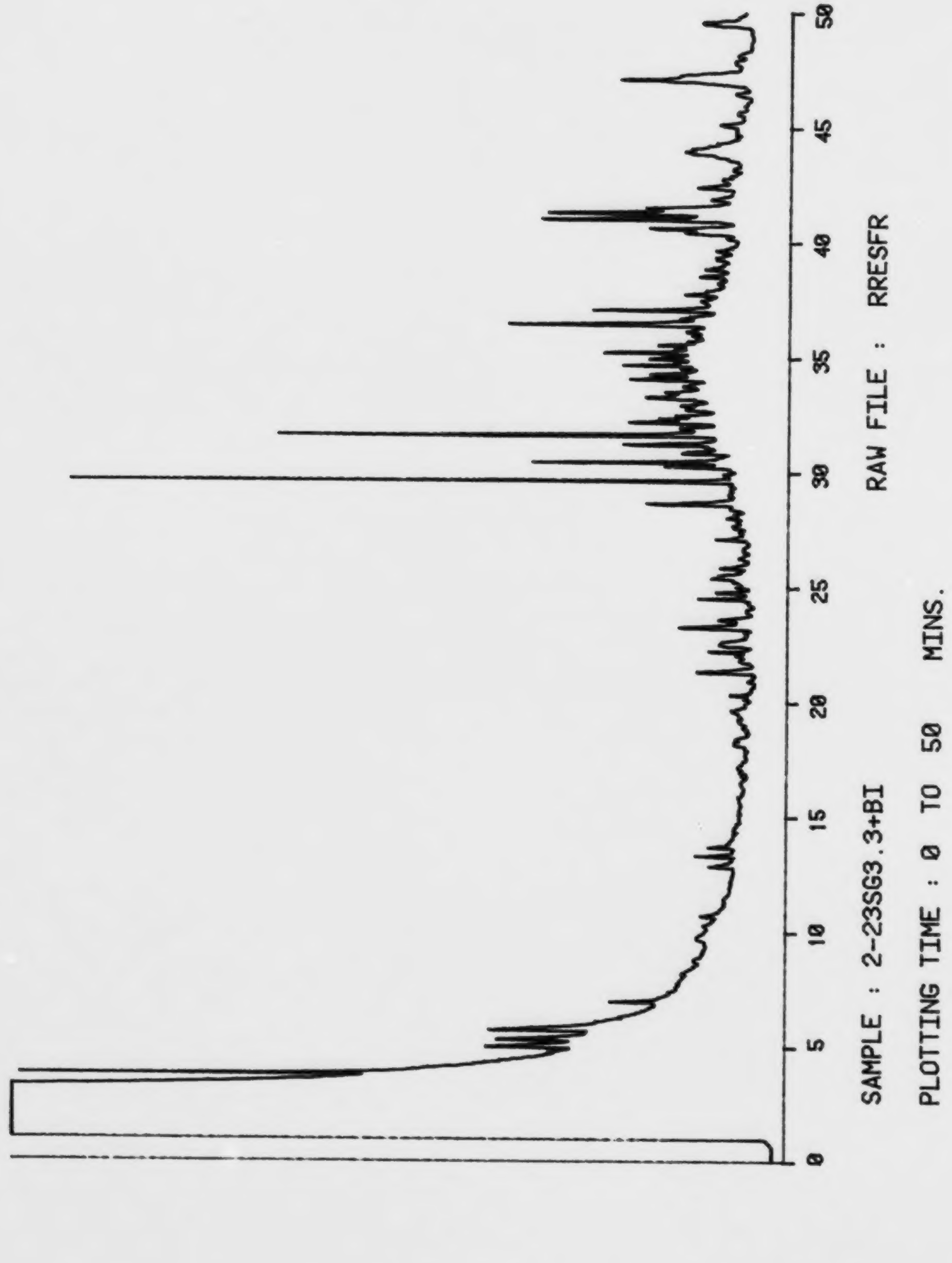
RAW FILE : RP8SFR

PLOTTING TIME : 0 TO 50 MINS.

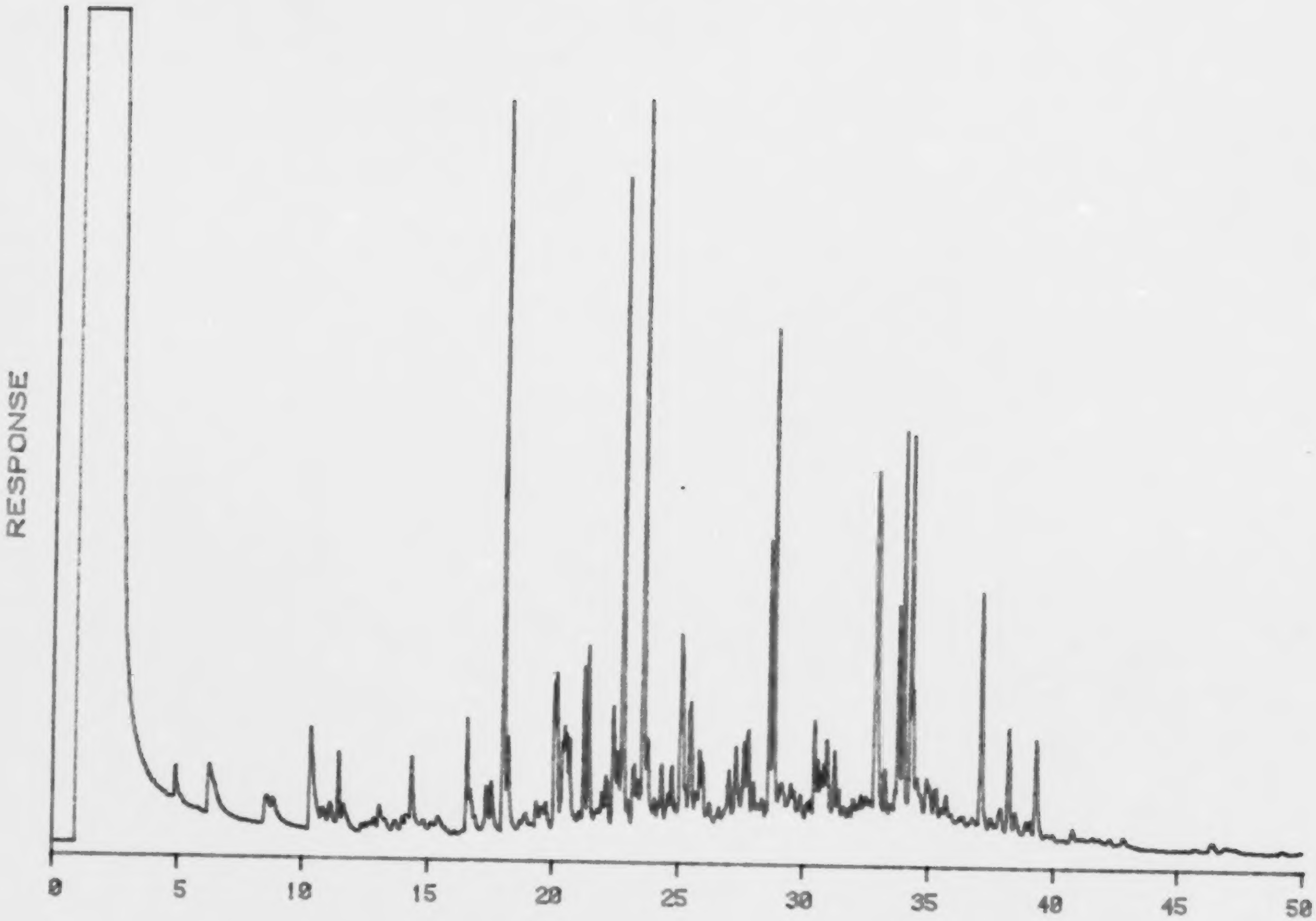
Computer reconstructed FID chromatogram of G3.2 fraction with 1,1'-binaphthyl co-injected as quantitative standard.


0
5
10
15
20
25
30
35
40
45
50
SAMPLE : 2-23SG3.2+BI
RAW FILE : RU8SFR
PLOTTING TIME : 0 TO 50 MINS.

Computer reconstructed FID chromatogram of G3.3 fraction with 1,1'-binaphthyl co-injected as quantitative standard.


0
5
10
15
20
25
30
35
40
45
50
SAMPLE : 2-23SG3.3+BI
RAW FILE : RRESFR
PLOTTING TIME : 0 TO 50 MINS.

Computer reconstructed FID gas chromatogram of G32 fraction with the aromatic retention standard added.



SAMPLE: 2-23S63.2+ST

SCALE FACTOR: .006

RAW FILE: S2232F

PLOT SPEED: 2

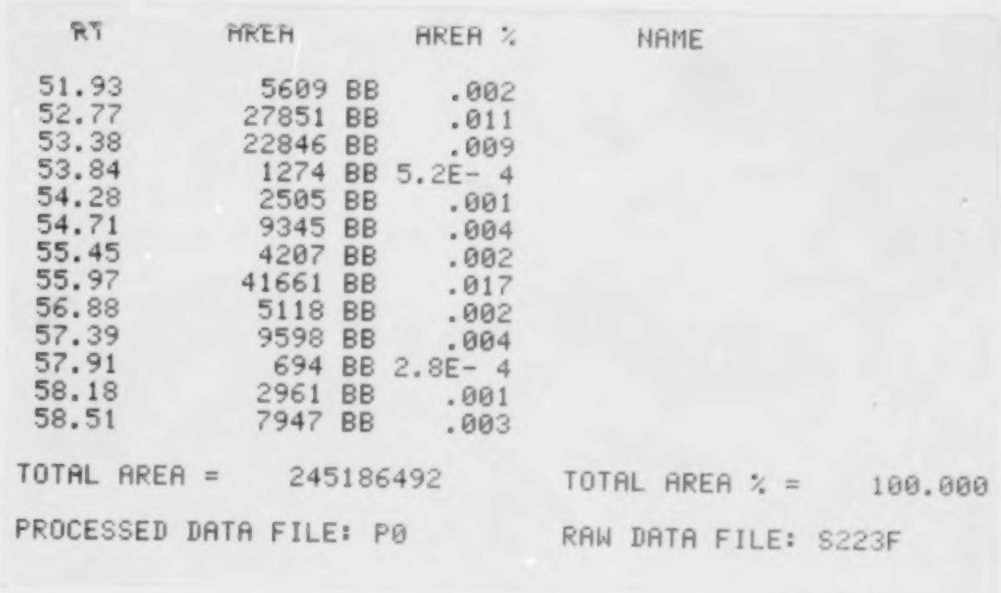
First stage processed FID file of G3 fraction with 1,1'-binaphthyl co-injected as quantitative standard. First column indicates the retention times of individual peaks; second column, the peak area in absolute units and third column, relative peak areas in per cent. The letters adjacent to the second column indicate the method of integration.

```
REPORT:     12.41  CHANNEL:  5

SAMPLE: 2-23S G3+BI   INJECTED AT  10:17:41 ON MAR 18, 1980

ZERO METHOD: M


ACTUAL RUN TIME:  60.008 MINUTES

SIGNAL > 1 VOLT


   RT        AREA         AREA %        NAME

  1.03   233933212 ↑S   95.410
  2.99      112451 HS     .046
  3.04      811302 HS     .331
  3.08     1179126 HS     .481
  3.17        2862 TV     .001
  3.23       42120 VT     .017
  3.35        1820 TT  7.4E- 4
  3.47        1211 TV  4.9E- 4
  3.57       11098 VV     .005
  3.85        3953 VV     .002
  3.95     1148523 HS     .468
  4.04        3051 TV     .001
  4.20        1302 VV  5.3E- 4
  4.28        2145 VV  8.7E- 4
  4.33        1029 VV  4.2E- 4
  4.40       18043 VV     .007
  4.45       39668 VV     .016
  4.52       10245 VT     .004
  4.69       10243 TV     .004
  4.82       15554 VV     .006
  4.89       14347 VV     .006
  5.08       32775 VV     .013
  5.22       16249 VV     .007
  5.33        8278 VV     .003
  5.41       28311 VV     .012
  5.47       19784 VV     .008
  5.53       14057 VV     .006
  5.65       15102 VV     .006
  5.80       76508 VV     .031
  5.95       41784 VV     .017
  6.22       76828 VV     .031
  6.32       28262 VV     .012
  6.43        6235 VV     .003
  6.55       12143 VV     .005
  6.63        6189 VV     .003
  6.76        7251 VV     .003
  6.90        4120 VV     .002
  7.00        8448 VV     .003
```

```
   7.13        5530 VV     .002
   7.22        5506 VV     .002
   7.34       19740 VV     .008
   7.42        7536 VV     .003
   7.52       15595 VV     .006
   7.65        6613 VV     .003
   7.79       11146 VV     .005
   7.94      406668 VV     .166

REPORT:     12.41  (CONTINUED)     PAGE:  2

    RT        AREA        AREA %        NAME

   8.11       35949 VV     .015
   8.29       71597 VV     .029
   8.43        6044 VV     .002
   8.59       18188 VV     .007
   8.75        6372 VV     .003
   8.80        2682 VV     .001
   8.90        2226 VV 9.1E- 4
   9.02        1156 VB 4.7E- 4
   9.10        3028 BB     .001
   9.18        2744 BB     .001
   9.34        1663 BB 6.8E- 4
   9.56        8705 BB     .004
   9.67       11022 BB     .004
   9.81        1357 BB 5.5E- 4
   9.87        4910 BB     .002
  10.02        2634 BB     .001
  10.30      237033 BB     .097
  10.46       61922 BB     .025
  10.65      100505 BB     .041
  10.84       15591 BB     .006
  10.96        1364 BB 5.6E- 4
  11.06         521 BB 2.1E- 4
  11.25        2134 BB 8.7E- 4
  11.36       11186 BB     .005
  11.62       11750 BB     .005
  11.73        4152 BB     .002
  11.84        7903 BB     .003
  11.99        7764 BB     .003
  12.13       63531 BB     .026
  12.30        3448 BB     .001
  12.43       34580 BB     .014
  12.65      166236 BB     .068
  12.82        2384 BB 9.7E- 4
  12.98       39937 BB     .016
  13.04       21351 BB     .009
  13.17       12522 BB     .005
  13.29        1303 BB 5.3E- 4
  13.38       22431 BB     .009
  13.45        1879 BB 7.7E- 4
  13.57       39014 BB     .016
  13.70        15311 BB     .006
  13.84         4885 BB     .002
  13.94        19241 BB     .008
  14.11         6884 BB     .003
  14.30         3694 BB     .002
  14.37        16921 BB     .007
  14.55        28052 BB     .011
  14.72       149347 BB     .061
  14.83         2438 BB 9.9E- 4
  14.95        38699 BB     .016
  15.10         3417 BB     .001
  15.18        16925 BB     .007
  15.27        31850 BB     .013
  15.41          623 BB 2.5E- 4
  15.49         5663 BB     .002
  15.60         2725 BB     .001

REPORT:     12.41  (CONTINUED)    PAGE:  3

   RT        AREA        AREA %       NAME

  15.66        13629 BB     .006
  15.77         3631 BB     .001
  15.93        55139 BB     .022
  16.14         1051 BB 4.3E- 4
  16.20         2050 BB 8.4E- 4
  16.29        78479 BB     .032
  16.41         7654 BB     .003
  16.51         4929 BB     .002
  16.57          785 BB 3.2E- 4
  16.73        74744 BB     .030
  16.81          602 BB 2.5E- 4
  16.85         2105 BB 8.6E- 4
  16.99         5689 BB     .002
  17.08        14602 BB     .006
  17.23         3252 BB     .001
  17.31        16618 BB     .007
  17.42         1998 BB 8.1E- 4
  17.50         2470 BB     .001
  17.62         7443 BB     .003
  17.76        12174 BB     .005
  18.02        20401 BB     .008
  18.22        11351 BB     .005
  18.33         2915 BB     .001
  18.41         2569 BB     .001
  18.52        32707 BB     .013
  18.65       107166 BB     .044
  18.75         4366 BB     .002
  18.87        15331 BB     .006
  18.96         1752 BB 7.1E- 4
  19.04         1317 BB 5.4E- 4
  19.13          586 BB 2.4E- 4
  19.27        68040 BB     .028
```

```
 19.51      43861 BB    .018
 19.73       8376 BB    .003
 19.89        911 BB 3.7E- 4
 20.04     288086 BB    .117
 20.20      62650 BB    .026
 20.32       2223 BB 9.1E- 4
 20.48      14543 BB    .006
 20.60       1276 BB 5.2E- 4
 20.68       8970 BB    .004
 20.76       1789 BB 7.3E- 4
 20.83       5384 BB    .002
 20.92       2225 BB 9.1E- 4
 21.16      24177 BB    .010
 21.34      22557 BB    .009
 21.48      20253 BB    .008
 21.57       1828 BB 7.5E- 4
 21.70      19004 BB    .008
 21.91       4384 BB    .002
 22.07      42042 BB    .017
 22.18      55861 BB    .023
 22.33      11048 BB    .005
 22.44      10531 BB    .004
 22.50      22696 BB    .009
 22.59      24148 BB    .010

REPORT:     12.41  (CONTINUED)    PAGE:  4

  RT        AREA        AREA %        NAME

 22.69       4463 BB    .002
 22.86       4001 BB    .002
 22.96       6240 BB    .003
 23.10      30476 BB    .012
 23.42     114112 BB    .047
 23.60       7926 BB    .003
 23.68       2224 BB 9.1E- 4
 23.85      10090 BB    .004
 23.99      17695 BB    .007
 24.13      13531 BB    .006
 24.21      11256 BB    .005
 24.36       3575 BB    .001
 24.45      30808 BB    .013
 24.55       4611 BB    .002
 24.64      33103 BB    .014
 24.89     284547 BB    .116
 25.02      15807 BB    .006
 25.25      41815 BB    .017
 25.41      13041 BB    .005
 25.47       1107 BB 4.5E- 4
 25.55      17765 BB    .007
 25.73     240835 BB    .098
 25.84      30657 BB    .013
 25.93       6556 BB    .003
 26.09       11936 BB    .005
 26.27        4266 BB    .002
 26.37       29943 BB    .012
 26.56        3299 BB    .001
 26.67       11836 BB    .005
 26.82       26959 BB    .011
 26.93         603 BB 2.5E- 4
 26.97        1250 BB 5.1E- 4
 27.16        3974 BB    .002
 27.26       31047 BB    .013
 27.34        5480 BB    .002
 27.41        2080 BB 8.5E- 4
 27.52       20293 BB    .008
 27.62       21754 BB    .009
 27.78        1222 BB 5.0E- 4
 27.82        4791 BB    .002
 27.98       17965 BB    .007
 28.08       19225 BB    .008
 28.22        3403 BB    .001
 28.32        4499 BB    .002
 28.43        7397 BB    .003
 28.50         637 BB 2.6E- 4
 28.61       11528 BB    .005
 28.69        4334 BB    .002
 28.83        7008 BB    .003
 28.92        1292 BB 5.3E- 4
 29.01        3475 BB    .001
 29.09       19226 BB    .008
 29.46      158957 BB    .065
 29.75       29726 BB    .012
 29.91       54203 BB    .022
 30.04        1553 BB 6.3E- 4

REPORT:     12.41  (CONTINUED)    PAGE:  5

  RT        AREA        AREA %      NAME

 30.10        8055 BB    .003
 30.27       17374 BB    .007
 30.37       23044 BB    .009
 30.66        3194 BB    .001
 30.78      137714 BB    .056
 30.95      169583 BB    .069
 31.05        9042 BB    .004
 31.19        1764 BB 7.2E- 4
 31.24        9597 BB    .004
 31.44       42057 BB    .017
 31.57        7653 BB    .003
 31.70       11517 BB    .005
 31.97        2070 BB 8.4E- 4
 32.00        1388 BB 5.7E- 4
 32.09       11193 BB    .005
 32.25       19121 BB    .008
```

```
  32.39          7422 BB     .003
  32.55         52457 BB     .021
  32.68         18278 BB     .007
  32.77           873 BB 3.6E- 4
  32.83          8081 BB     .003
  32.95          8207 BB     .003
  33.05         43321 BB     .018
  33.16          1139 BB 4.6E- 4
  33.28          3954 BB     .002
  33.36         37203 BB     .015
  33.49         39721 BB     .016
  33.65          1715 BB 7.0E- 4
  33.70          1122 BB 4.6E- 4
  33.75          2902 BB     .001
  33.92         14301 BB     .006
  34.02          1245 BB 5.1E- 4
  34.13         12391 BB     .005
  34.28          3503 BB     .001
  34.38          6822 BB     .003
  34.47           533 BB 2.2E- 4
  34.51           644 BB 2.6E- 4
  34.59          8056 BB     .003
  34.66          3642 BB     .001
  34.80         12402 BB     .005
  34.89           806 BB 3.3E- 4
  35.07         43147 BB     .018
  35.39         39601 BB     .016
  35.50          6147 BB     .003
  35.61         22558 BB     .009
  35.75          4557 BB     .002
  36.03        117886 BB     .048
  36.24        179033 BB     .073
  36.60        119041 BB     .049
  36.67           723 BB 2.9E- 4
  36.77         14847 BB     .006
  36.96         38558 BB     .016
  37.07         37488 BB     .015
  37.24          1722 BB 7.0E- 4
  37.30          1901 BB 7.8E- 4
  37.39         32315 BB     .013

REPORT:     12.41   (CONTINUED)     PAGE:  6

   RT         AREA         AREA %        NAME

  37.63         12589 BB     .005
  37.73         13071 BB     .005
  37.87          2910 BB     .001
  37.93           850 BB 3.5E- 4
  38.17          4214 BB     .002
  38.21          1176 BB 4.8E- 4
  38.41          2590 BB     .001
  38.48          1738 BB 7.1E- 4
  38.54       2739 BB     .001
  38.63       6696 BB     .003
  38.83       4399 BB     .002
  38.98        730 BB 3.0E- 4
  39.16       8636 BB     .004
  39.25       2615 BB     .001
  39.43      78412 BB     .032
  39.54      21966 BB     .009
  39.81       4934 BB     .002
  39.86       1155 BB 4.7E- 4
  40.31     410047 BB     .167
  40.92      41903 BB     .017
  41.23      97628 BB     .040
  41.41      17727 BB     .007
  41.69       2846 BB     .001
  41.95      88922 BB     .036
  42.17       5427 BB     .002
  42.33       5544 BB     .002
  42.54        608 BB 2.5E- 4
  42.81       5486 BB     .002
  42.97      11705 BB     .005
  43.46      76565 BB     .031
  43.70      35734 BB     .015
  44.03      25144 BB     .010
  44.23       3667 BB     .001
  44.38       2060 BB 8.4E- 4
  44.64       3565 BB     .001
  44.87       7764 BB     .003
  45.02        923 BB 3.8E- 4
  45.17        891 BB 3.6E- 4
  45.33       2475 BB     .001
  45.64     113203 BB     .046
  46.03      17535 BB     .007
  46.26       1181 BB 4.8E- 4
  46.62      10235 BB     .004
  46.83       6138 BB     .003
  47.19        520 BB 2.1E- 4
  47.51       8684 BB     .004
  47.99       1793 BB 7.3E- 4
  48.33       5232 BB     .002
  49.03      30896 BB     .013
  49.39       4468 BB     .002
  49.88       4133 BB     .002
  50.45       5776 BB     .002
  51.05        651 BB 2.7E- 4
  51.24        558 BB 2.3E- 4
  51.39       1270 BB 5.2E- 4
  51.56        754 BB 3.1E- 4

REPORT:     12.41  (CONTINUED)     PAGE:  7
```



```
  RT          AREA       AREA %        NAME

 51.93        5609 BB      .002
 52.77       27851 BB      .011
 53.38       22846 BB      .009
 53.84        1274 BB  5.2E- 4
 54.28        2505 BB      .001
 54.71        9345 BB      .004
 55.45        4207 BB      .002
 55.97       41661 BB      .017
 56.88        5118 BB      .002
 57.39        9598 BB      .004
 57.91         694 BB  2.8E- 4
 58.18        2961 BB      .001
 58.51        7947 BB      .003

TOTAL AREA =     245186492        TOTAL AREA % =    100.000

PROCESSED DATA FILE: P0           RAW DATA FILE: S223F
```

First stage processed FID file of G3.1 fraction with 1,1'-binaphthyl co-injected as quantitative standard.

```
REPORT:      3.31  CHANNEL:  4

SAMPLE: 2-23-SG3.1+B  INJECTED AT  11:21:27 ON MAR 26, 1980

ZERO METHOD: M


ACTUAL RUN TIME:  60.008 MINUTES

SIGNAL > 1 VOLT


   RT        AREA        AREA %        NAME

   .97   187290300 ↑S  92.931
  2.57    10724926 HS   5.322
  4.42         613 TV 3.0E- 4
  4.65       17747 VV    .009
  4.95         962 VT 4.8E- 4
  5.36         544 VV 2.7E- 4
  5.70        2751 BV    .001
  5.79        1261 VV 6.3E- 4
  5.89        4345 VV    .002
  6.01        2991 VV    .001
  6.12         979 VV 4.9E- 4
  6.34       80477 VV    .040
  6.65       56548 VV    .028
  6.92       22568 VV    .011
  7.43        1121 VV 5.6E- 4
  7.47        1740 VV 8.6E- 4
  7.65         516 VV 2.6E- 4
  7.81        1492 VB 7.4E- 4
  7.90         745 BV 3.7E- 4
  8.02        2340 VV    .001
  8.21        8919 VV    .004
  8.52         653 VV 3.2E- 4
  8.66       54668 VV    .027
  8.81       68208 VV    .034
  8.94       70395 VB    .035
  9.66        3351 BB    .002
  9.95        3055 BB    .002
 10.18        3676 BB    .002
 10.57       13085 BB    .006
 10.76        4210 BB    .002
 10.96       80499 BB    .040
 11.27       62976 BB    .031
 11.65         733 BB 3.6E- 4
 11.86        1881 BB 9.3E- 4
 12.02        4137 BB    .002
 12.26       11502 BB    .006
 12.41        2559 BB    .001
 12.57         923 BB 4.6E- 4
 12.72        9299 BB    .005
 12.89        7473 BB    .004
 13.05      148134 BB    .074
 13.51        9370 BB    .005
 13.70        1972 BB 9.8E- 4
 13.94       42180 BB    .021
 14.18       15463 BB    .008
 14.31        1444 BB 7.2E- 4

REPORT:     3.31  (CONTINUED)    PAGE:  2

   RT       AREA        AREA %        NAME

 14.46         749 BB 3.7E- 4
 14.56        1209 BB 6.0E- 4
 14.59        2741 BB    .001
 14.71         704 BB 3.5E- 4
 14.75         636 BB 3.2E- 4
 14.79        1015 BB 5.0E- 4
 14.92        2870 BB    .001
 14.95         546 BB 2.7E- 4
 15.05       51744 BB    .026
 15.35        2645 BB    .001
 15.44        1742 BB 8.6E- 4
 15.60        1485 BB 7.4E- 4
 15.64         800 BB 4.0E- 4
 15.71        5083 BB    .003
 15.89        3531 BB    .002
 16.03       19126 BB    .009
 16.17        1154 BB 5.7E- 4
 16.20         559 BB 2.8E- 4
 16.28       14144 BB    .007
 16.45         902 BB 4.5E- 4
 16.53       13102 BB    .007
 16.74        1274 BB 6.3E- 4
 16.84        1128 BB 5.6E- 4
 16.98      135513 BB    .067
 17.10        1154 BB 5.7E- 4
 17.27        3049 BB    .002
 17.47        7115 BB    .004
 17.58        5273 BB    .003
 17.63         885 BB 4.4E- 4
 17.71        2472 BB    .001
 17.82        9345 BB    .005
 17.90         677 BB 3.4E- 4
 17.98        3193 BB    .002
 18.02        1736 BB 8.6E- 4
 18.06        2031 BB    .001
 18.10        2155 BB    .001
 18.14        2293 BB    .001
 18.18        1649 BB 8.2E- 4
 18.37        2065 BB    .001
 18.41        2126 BB    .001
 18.44        1096 BB 5.4E- 4
 18.49         913 BB 4.5E- 4
 18.52          2187 BB    .001
 18.57          1205 BB 6.0E- 4
 18.60          5496 BB    .003
 18.81          5830 BB    .003
 18.90          5925 BB    .003
 18.96          1251 BB 6.2E- 4
 19.08          2856 BB    .001
 19.13          1551 BB 7.7E- 4
 19.31          3461 BB    .002
 19.35          1654 BB 8.2E- 4
 19.39           900 BB 4.5E- 4
 19.43          1285 BB 6.4E- 4
 19.47          3415 BB    .002
 19.62          1859 BB 9.2E- 4

REPORT:      3.31  (CONTINUED)     PAGE:  3

  RT         AREA          AREA %       NAME

 19.70          4142 BB    .002
 19.76          1567 BB 7.8E- 4
 19.79          1527 BB 7.6E- 4
 19.83          1123 BB 5.6E- 4
 19.87          2032 BB    .001
 19.91          1768 BB 8.8E- 4
 20.02          6322 BB    .003
 20.09          1597 BB 7.9E- 4
 20.13          1970 BB 9.8E- 4
 20.17          2503 BB    .001
 20.21          1771 BB 8.8E- 4
 20.36         16470 BB    .008
 20.45          5139 BB    .003
 20.57          3831 BB    .002
 20.65          2576 BB    .001
 20.77         15648 BB    .008
 21.00          1308 BB 6.5E- 4
 21.05          1168 BB 5.8E- 4
 21.09          2357 BB    .001
 21.13          2053 BB    .001
 21.17          1607 BB 8.0E- 4
 21.28         26848 BB    .013
 21.52          2343 BB    .001
 21.60          2695 BB    .001
 21.63          1129 BB 5.6E- 4
 21.68           550 BB 2.7E- 4
 21.75         14471 BB    .007
 21.94          4844 BB    .002
 22.03          1381 BB 6.9E- 4
 22.09          8161 BB    .004
 22.20          2654 BB    .001
 22.23           713 BB 3.5E- 4
 22.30          2184 BB    .001
 22.33           525 BB 2.6E- 4
 22.36           570 BB 2.8E- 4
```

```
  22.45        23698 BB    .012
  22.57         1413 BB 7.0E- 4
  22.62         2130 BB    .001
  22.65         3952 BB    .002
  22.85         1829 BB 9.1E- 4
  22.88         4329 BB    .002
  22.96         2538 BB    .001
  23.04         2060 BB    .001
  23.07         2743 BB    .001
  23.12         2600 BB    .001
  23.21          748 BB 3.7E- 4
  23.25         2015 BB 1.0E- 3
  23.29         2744 BB    .001
  23.33         1415 BB 7.0E- 4
  23.37         1431 BB 7.1E- 4
  23.42         1271 BB 6.3E- 4
  23.61         3551 BB    .002
  23.72        47017 BB    .023
  23.94         2730 BB    .001
  24.05        19789 BB    .010
  24.14         1487 BB 7.4E- 4

REPORT:      3.31  (CONTINUED)    PAGE:  4

   RT         AREA        AREA %        NAME

  24.19         2017 BB    .001
  24.28        16721 BB    .008
  24.35         1455 BB 7.2E- 4
  24.40         1876 BB 9.3E- 4
  24.59        10710 BB    .005
  24.66         4174 BB    .002
  24.81         1919 BB 9.5E- 4
  24.85         3060 BB    .002
  24.89         2326 BB    .001
  24.93         2091 BB    .001
  24.98         2108 BB    .001
  25.02         1512 BB 7.5E- 4
  25.07         1705 BB 8.5E- 4
  25.11         5081 BB    .003
  25.19         1687 BB 8.4E- 4
  25.44        13587 BB    .007
  25.54        20953 BB    .010
  25.62         1409 BB 7.0E- 4
  25.66          928 BB 4.6E- 4
  25.71          956 BB 4.7E- 4
  25.80         7592 BB    .004
  25.90         1342 BB 6.7E- 4
  25.94         5229 BB    .003
  26.02         1664 BB 8.3E- 4
  26.09         1286 BB 6.4E- 4
  26.13         2571 BB    .001
  26.17         2406 BB    .001
  26.22         3850 BB    .002
```

```
 26.26         4231 BB    .002
 26.31         3685 BB    .002
 26.35         3341 BB    .002
 26.39         2912 BB    .001
 26.44         1659 BB 8.2E- 4
 26.48         2270 BB    .001
 26.52         1685 BB 8.4E- 4
 26.60         7339 BB    .004
 26.73        34847 BB    .017
 26.81         2037 BB    .001
 26.87         1999 BB 9.9E- 4
 26.91         2254 BB    .001
 26.95         2402 BB    .001
 27.08         1736 BB 8.6E- 4
 27.12         3493 BB    .002
 27.20         2653 BB    .001
 27.24         2701 BB    .001
 27.28         1718 BB 8.5E- 4
 27.34         1870 BB 9.3E- 4
 27.38         2614 BB    .001
 27.56         5791 BB    .003
 27.64        29480 BB    .015
 27.73          920 BB 4.6E- 4
 27.78         5884 BB    .003
 27.86         2283 BB    .001
 27.91         1793 BB 8.9E- 4
 27.99         3853 BB    .002
 28.04          829 BB 4.1E- 4

REPORT:      3.31  (CONTINUED)    PAGE:  5

  RT         AREA        AREA %        NAME

 28.12        10966 BB    .005
 28.21         7924 BB    .004
 28.35         1944 BB 9.6E- 4
 28.39         2271 BB    .001
 28.49        51186 BB    .025
 28.62         1377 BB 6.8E- 4
 28.67         1296 BB 6.4E- 4
 28.71         1869 BB 9.3E- 4
 28.75         1885 BB 9.4E- 4
 28.80         2983 BB    .001
 28.84         1654 BB 8.2E- 4
 28.90         1863 BB 9.2E- 4
 28.94         7943 BB    .004
 29.02         1217 BB 6.0E- 4
 29.09         1083 BB 5.4E- 4
 29.18        35420 BB    .018
 29.32         1095 BB 5.4E- 4
 29.40         8742 BB    .004
 29.54         8337 BB    .004
 29.61         1100 BB 5.5E- 4
 29.66         1715 BB 8.5E- 4
 29.71          945 BB 4.7E- 4
 29.75         2053 BB     .001
 29.79         1467 BB 7.3E- 4
 29.84         4436 BB     .002
 29.97         2507 BB     .001
 30.02          807 BB 4.0E- 4
 30.06         2078 BB     .001
 30.20        36340 BB     .018
 30.34         2491 BB     .001
 30.41         1647 BB 8.2E- 4
 30.45         2670 BB     .001
 30.55         1727 BB 8.6E- 4
 30.68         2584 BB     .001
 30.73          758 BB 3.8E- 4
 30.80        11800 BB     .006
 30.90         2210 BB     .001
 30.94         1965 BB 9.8E- 4
 30.98          901 BB 4.5E- 4
 31.08         1550 BB 7.7E- 4
 31.17         2548 BB     .001
 31.22         2214 BB     .001
 31.27         2540 BB     .001
 31.33         2158 BB     .001
 31.49        28822 BB     .014
 31.67        62597 BB     .031
 31.79         1373 BB 6.8E- 4
 31.84         2115 BB     .001
 31.88         1594 BB 7.9E- 4
 31.93         3674 BB     .002
 31.98         1784 BB 8.9E- 4
 32.02         1904 BB 9.4E- 4
 32.11        37014 BB     .018
 32.34         7572 BB     .004
 32.43         7871 BB     .004
 32.69         3129 BB     .002

REPORT:       3.31  (CONTINUED)    PAGE:  6

  RT          AREA         AREA %         NAME

 32.75         1964 BB 9.7E- 4
 32.84         7468 BB     .004
 32.92         1963 BB 9.7E- 4
 32.96         1803 BB 8.9E- 4
 33.02         1325 BB 6.6E- 4
 33.12        30428 BB     .015
 33.29         4650 BB     .002
 33.34         3558 BB     .002
 33.43         2640 BB     .001
 33.48         2501 BB     .001
 33.63        10713 BB     .005
 33.68         2839 BB     .001
 33.78        18811 BB     .009
 33.90         4052 BB     .002
 33.95         2977 BB     .001
 33.99         2343 BB     .001
 34.04         2549 BB     .001
 34.09         3513 BB     .002
 34.14         2564 BB     .001
 34.19         2735 BB     .001
 34.24         1894 BB 9.4E- 4
 34.29        10594 BB     .005
 34.45        67760 BB     .034
 34.63         9500 BB     .005
 34.68          625 BB 3.1E- 4
 34.72         4413 BB     .002
 34.88       188557 BB     .094
 35.12         1900 BB 9.4E- 4
 35.22        21653 BB     .011
 35.36        16087 BB     .008
 35.44         1710 BB 8.5E- 4
 35.62        10577 BB     .005
 35.83        34742 BB     .017
 36.12        47384 BB     .024
 36.30        17236 BB     .009
 36.54        16117 BB     .008
 36.75       109398 BB     .054
 37.04        14650 BB     .007
 37.20         1054 BB 5.2E- 4
 37.29         1771 BB 8.8E- 4
 37.44        66720 BB     .033
 37.84        19896 BB     .010
 38.06       187071 BB     .093
 38.40        10612 BB     .005
 38.60        86662 BB     .043
 38.84         1380 BB 6.8E- 4
 39.24         3531 BB     .002
 39.52          948 BB 4.7E- 4
 39.58          949 BB 4.7E- 4
 39.84        49286 BB     .024
 40.07        31074 BB     .015
 40.34         3379 BB     .002
 40.50         1481 BB 7.3E- 4
 40.74        18747 BB     .009
 41.26       153929 BB     .076
 41.50        10891 BB     .005

  REPORT:        3.31  (CONTINUED)    PAGE:  7
  RT          AREA        AREA %        NAME

 41.94         11150 BB    .006
 42.90           596 BB 3.0E- 4
 43.65         37926 BB    .019
 43.86          2127 BB    .001
 44.09           641 BB 3.2E- 4
 44.59           915 BB 4.5E- 4
 45.76           652 BB 3.2E- 4
 46.33          1651 BB 8.2E- 4
 47.39          2378 BB    .001
 50.80          1227 BB 6.1E- 4

TOTAL AREA =    201536221        TOTAL AREA % =    100.000

PROCESSED DATA FILE: P0          RAW DATA FILE: S2231F
```

First stage processed FID file of G3.2 fraction with 1,1'-binaphthyl co-injected as quantitative standard.

```
REPORT:     29.41  CHANNEL:  4

SAMPLE: 2-23SG3.2+BI  INJECTED AT  11:39:41 ON MAR 31, 1980

ZERO METHOD: M


ACTUAL RUN TIME:  60.008 MINUTES

SIGNAL > 1 VOLT


   RT          AREA        AREA %        NAME

  1.00   174610717 ↑S   94.924
  2.49     5266551 HS    2.863
  4.66        2952 TT     .002
  6.18      117745 BV     .064
  8.53       39725 BV     .022
  8.76       53957 VB     .029
 10.43        2973 BB     .002
 10.80        7634 BB     .004
 11.08       16350 BB     .009
 11.45        3019 BB     .002
 11.64       13746 BB     .007
 12.37        2412 BB     .001
 12.51        1707 BB 9.3E- 4
 12.69         557 BB 3.0E- 4
 12.85        3724 BB     .002
 13.09       15833 BB     .009
 13.71        8619 BB     .005
 13.99        8231 BB     .004
 14.36       47556 BB     .026
 14.88        1206 BB 6.6E- 4
 15.17        4544 BB     .002
 15.44       13177 BB     .007
 15.84        1030 BB 5.6E- 4
 16.09        2644 BB     .001
 16.35         519 BB 2.8E- 4
 16.69        1816 BB 9.9E- 4
 16.78        1115 BB 6.1E- 4
 16.90        1740 BB 9.5E- 4
 17.36       22716 BB     .012
 17.56       26128 BB     .014
 18.01      292262 BB     .159
 18.20       22089 BB     .012
 18.92        3279 BB     .002
 19.36       12328 BB     .007
 19.56        5066 BB     .003
 19.73       10966 BB     .006
 20.07       21314 BB     .012
 20.15       34322 BB     .019
 20.41         4603 BB    .003
 20.48         8012 BB    .004
 20.86          805 BB 4.4E- 4
 20.98          579 BB 3.1E- 4
 21.10         5362 BB    .003
 21.42       114005 BB    .062
 21.70         1572 BB 8.5E- 4
 21.82         1201 BB 6.5E- 4

REPORT:     29.41  (CONTINUED)    PAGE:  2

  RT          AREA        AREA %         NAME

 21.97         8943 BB    .005
 22.13         5022 BB    .003
 22.42        31372 BB    .017
 22.50         2858 BB    .002
 22.62        16139 BB    .009
 22.81       347358 BB    .189
 23.01         8377 BB    .005
 23.21         5282 BB    .003
 23.27         4651 BB    .003
 23.39         9170 BB    .005
 23.48         1752 BB 9.5E- 4
 23.62       319255 BB    .174
 23.79        21821 BB    .012
 24.08         9399 BB    .005
 24.25         4004 BB    .002
 24.34        35813 BB    .019
 24.65        14237 BB    .008
 24.78        28410 BB    .015
 24.97         3761 BB    .002
 25.20        97423 BB    .053
 25.33         4717 BB    .003
 25.53        98261 BB    .053
 25.75         7506 BB    .004
 25.88        20658 BB    .011
 26.00        18273 BB    .010
 26.28        15825 BB    .009
 26.58          679 BB 3.7E- 4
 26.66         5335 BB    .003
 26.89          658 BB 3.6E- 4
 27.06        39774 BB    .022
 27.44        81934 BB    .045
 27.67        27763 BB    .015
 27.81         9292 BB    .005
 28.05        14278 BB    .008
 28.20         5667 BB    .003
 28.39        11149 BB    .006
 28.55         2439 BB    .001
 28.68       151654 BB    .082
 28.84       214231 BB    .116
 29.10         1149 BB 6.2E- 4
 29.18         2499 BB     .001
 29.54        12492 BB     .007
 29.65         6865 BB     .004
 29.78          572 BB 3.1E- 4
 29.88        16920 BB     .009
 30.20        10757 BB     .006
 30.33         5962 BB     .003
 30.47        55699 BB     .030
 30.61        16040 BB     .009
 30.75        10489 BB     .006
 30.85         9682 BB     .005
 30.97        39846 BB     .022
 31.29        43340 BB     .024
 31.45        11621 BB     .006
 31.64         8755 BB     .005
 31.85         6222 BB     .003

REPORT:     29.41  (CONTINUED)     PAGE:  3

  RT        AREA         AREA %        NAME

 32.03        14353 BB     .008
 32.21         2223 BB     .001
 32.33         8400 BB     .005
 32.49          895 BB 4.9E- 4
 32.53          617 BB 3.4E- 4
 32.57          842 BB 4.6E- 4
 32.67         3340 BB     .002
 32.95        16981 BB     .009
 33.28        37535 BB     .020
 33.51         2003 BB     .001
 33.56         1246 BB 6.8E- 4
 33.71         1084 BB 5.9E- 4
 33.85       124700 BB     .068
 34.02       158682 BB     .086
 34.34       192123 BB     .104
 34.58         7181 BB     .004
 34.63          600 BB 3.3E- 4
 34.73         5177 BB     .003
 34.96         9814 BB     .005
 35.06         6057 BB     .003
 35.28         1831 BB 1.0E- 3
 35.56         2800 BB     .002
 35.61          719 BB 3.9E- 4
 35.74        14489 BB     .008
 35.93         2342 BB     .001
 36.11          556 BB 3.0E- 4
 36.23         1888 BB     .001
 36.42         6372 BB     .003
 36.67         1544 BB 8.4E- 4
 36.76         1543 BB 8.4E- 4
 36.95          529 BB 2.9E- 4
 37.15       174914 BB     .095
```

```
  37.57        8401 BB    .005
  37.71        2177 BB    .001
  37.92       29532 BB    .016
  38.28      103286 BB    .056
  38.51       26861 BB    .015
  38.94        7313 BB    .004
  39.11        9438 BB    .005
  39.38       90760 BB    .049
  39.72         558 BB 3.0E- 4
  39.81        1175 BB 6.4E- 4
  40.00        4598 BB    .002
  40.28         768 BB 4.2E- 4
  40.41        1266 BB 6.9E- 4
  40.84       15172 BB    .008
  41.10         546 BB 3.0E- 4
  41.21        2064 BB    .001
  41.40         621 BB 3.4E- 4
  41.61        5382 BB    .003
  41.82        2103 BB    .001
  42.29         868 BB 4.7E- 4
  42.84         564 BB 3.1E- 4
  42.88         802 BB 4.4E- 4
  45.39         872 BB 4.7E- 4
  45.75        2950 BB    .002

REPORT:     29.41  (CONTINUED)    PAGE:  4

   RT         AREA        AREA %       NAME

  45.92         765 BB 4.2E- 4
  46.42        1623 BB 8.8E- 4
  47.00        5728 BB    .003
  47.43         539 BB 2.9E- 4
  47.88         988 BB 5.4E- 4
  48.99        1149 BB 6.2E- 4
  49.24        4123 BB    .002
  50.00        7987 BB    .004
  56.09         506 BB 2.7E- 4

TOTAL AREA =     183947357        TOTAL AREA % =     100.000

PROCESSED DATA FILE: P0           RAW DATA FILE: T2232F
```

First stage processed FID file of G3.3 fraction with 1,1'-binaphthyl co-injected as quantitative standard.

```
REPORT: .   21.11  CHANNEL:  5

SAMPLE: 2-23SG3.3+BI  INJECTED AT  12:39:12 ON MAR 28, 1980

ZERO METHOD: M


ACTUAL RUN TIME:  60.008 MINUTES

SIGNAL > 1 VOLT


   RT         AREA        AREA %        NAME

    .87          948 BH 4.3E- 4
   1.03    213557019 HS  97.873
   2.76      1941873 HS    .890
   2.87       453944 HS    .208
   2.91      1669237 HS    .765
   3.08         3187 TT    .001
   3.81        22373 TV    .010
   4.80          676 TV 3.1E- 4
   5.01        13873 VV    .006
   5.34        14544 VV    .007
   5.64         1373 VV 6.3E- 4
   5.75        23545 VV    .011
   6.10         3503 VV    .002
   6.33         1619 VT 7.4E- 4
   6.98         4101 VV    .002
   7.16          645 VV 3.0E- 4
   7.76          567 VV 2.6E- 4
   8.19          567 BB 2.6E- 4
   8.75         1309 VV 6.0E- 4
  10.29          792 BB 3.6E- 4
  10.71         1829 BB 8.4E- 4
  11.40          669 BB 3.1E- 4
  12.88         2440 BB    .001
  13.33         2842 BB    .001
  13.71         3297 BB    .002
  17.17          799 BB 3.7E- 4
  18.41          729 BB 3.3E- 4
  18.92          501 BB 2.3E- 4
  20.37         1708 BB 7.8E- 4
  20.95          685 BB 3.1E- 4
  21.36         8495 BB    .004
  22.10          870 BB 4.0E- 4
  22.25         2214 BB    .001
  22.56         7105 BB    .003
  23.08          535 BB 2.5E- 4
  23.29         8332 BB    .004
  23.63         2750 BB    .001
  24.54         3743 BB    .002
  24.82         2751 BB    .001
```

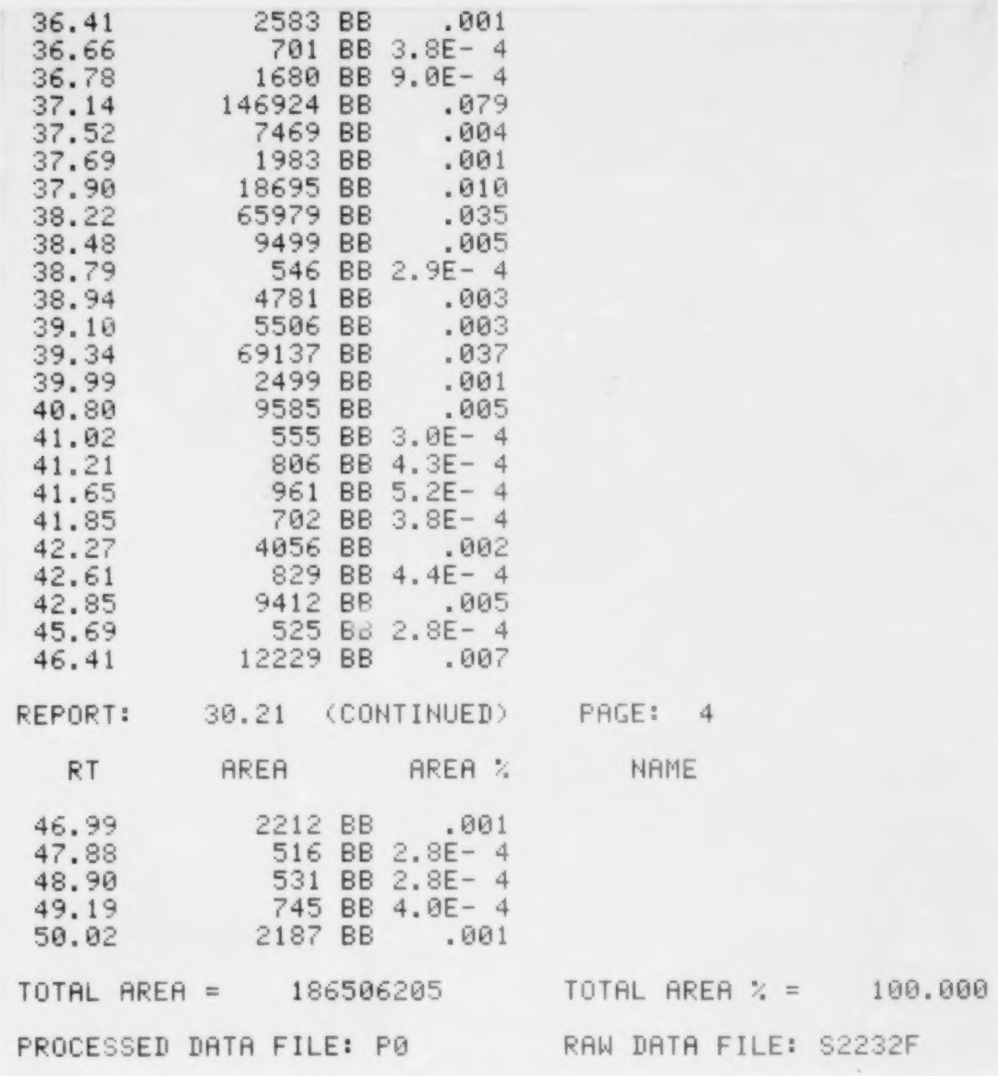
```
    25.04          590 BB 2.7E- 4
    25.43         1061 BB 4.9E- 4
    25.55         1086 BB 5.0E- 4
    25.88         2854 BB    .001
    26.30          727 BB 3.3E- 4
    27.13         2699 BB    .001
    27.45          571 BB 2.6E- 4

REPORT:     21.11  (CONTINUED)     PAGE:  2

     RT         AREA        AREA %        NAME

    28.05          930 BB 4.3E- 4
    28.23          635 BB 2.9E- 4
    28.46          941 BB 4.3E- 4
    28.67        10091 BB    .005
    29.06          725 BB 3.3E- 4
    29.68        38350 BB    .018
    29.94         1004 BB 4.6E- 4
    30.30         4145 BB    .002
    30.48        17017 BB    .008
    30.89         5316 BB    .002
    31.26         9245 BB    .004
    31.66        38970 BB    .018
    31.98         1482 BB 6.8E- 4
    32.23         6868 BB    .003
    32.39         1295 BB 5.9E- 4
    32.52         1572 BB 7.2E- 4
    32.81         2254 BB    .001
    32.98         1431 BB 6.6E- 4
    33.33         3472 BB    .002
    33.41          509 BB 2.3E- 4
    33.54         1650 BB 7.6E- 4
    33.83         1248 BB 5.7E- 4
    34.11         6266 BB    .003
    34.31         3659 BB    .002
    34.59         1122 BB 5.1E- 4
    34.72         3718 BB    .002
    34.99         4463 BB    .002
    35.26         7301 BB    .003
    35.60         2325 BB    .001
    36.00         1111 BB 5.1E- 4
    36.17         2174 BB 1.0E- 3
    36.49        21867 BB    .010
    36.74          635 BB 2.9E- 4
    36.82          633 BB 2.9E- 4
    37.11        10579 BB    .005
    37.51         2077 BB 9.5E- 4
    37.79         2209 BB    .001
    38.27          505 BB 2.3E- 4
    38.54         2518 BB    .001
    38.87         2213 BB    .001
```

```
   39.67         2033 BB 9.3E- 4
   40.23         1046 BB 4.8E- 4
   40.46         2496 BB     .001
   40.66         5861 BB     .003
   41.05        19771 BB     .009
   41.33        13728 BB     .006
   41.52         2849 BB     .001
   41.90         3261 BB     .001
   42.43         4655 BB     .002
   42.76         1401 BB 6.4E- 4
   43.99         2202 BB     .001
   44.12          719 BB 3.3E- 4
   44.36          515 BB 2.4E- 4
   45.16         3177 BB     .001
   45.65         1544 BB 7.1E- 4
   46.50         2453 BB     .001

REPORT:     21.11  (CONTINUED)     PAGE:  3

   RT        AREA         AREA %        NAME

   47.13        33652 BB     .015
   48.15         1794 BB 8.2E- 4
   49.59        12055 BB     .006
   51.00          627 BB 2.9E- 4
   51.39          574 BB 2.6E- 4
   51.60         1257 BB 5.8E- 4
   54.06         7478 BB     .003
   54.57         2322 BB     .001
   54.94          865 BB 4.0E- 4
   55.96          567 BB 2.6E- 4
   56.68         7776 BB     .004
   57.39        58261 BB     .027
   59.77          600 BB 2.7E- 4

TOTAL AREA =     218197788        TOTAL AREA % =     100.000

PROCESSED DATA FILE: P0           RAW DATA FILE: S2233F
```

First stage processed FID file of G3.2 fraction with co-injected aromatic retention standard.

```
REPORT:    30.21  CHANNEL:  4

SAMPLE: 2-23SG3.2+ST  INJECTED AT  13:04:41 ON MAR 31, 1980

ZERO METHOD: M


ACTUAL RUN TIME:  60.008 MINUTES

SIGNAL > 1 VOLT


   RT          AREA         AREA %          NAME

   .95    176860957 ↑S   94.828
  2.46      5852756 HS    3.138
  4.08          851 TT 4.6E- 4
  4.70          714 TV 3.8E- 4
  4.85         1217 VV 6.5E- 4
  4.93        25803 VT     .014
  5.80         1430 TB 7.7E- 4
  6.30        62271 BV     .033
  6.51        45527 VB     .024
  8.59        39579 BV     .021
  8.84        48444 VB     .026
 10.34       105377 BB     .057
 10.81         8406 BB     .005
 11.10        16093 BB     .009
 11.46        30594 BB     .016
 11.67         9892 BB     .005
 12.38         2651 BB     .001
 12.53         1918 BB     .001
 12.72         1580 BB 8.5E- 4
 12.87         4358 BB     .002
 13.08        11644 BB     .006
 13.35          627 BB 3.4E- 4
 13.73         9032 BB     .005
 14.01         4960 BB     .003
 14.15         1701 BB 9.1E- 4
 14.36        40350 BB     .022
 14.88         6404 BB     .003
 15.18         4103 BB     .002
 15.44         4511 BB     .002
 15.85          586 BB 3.1E- 4
 16.10         2200 BB     .001
 16.61        10578 BB     .006
 16.72         6610 BB     .004
 17.38        22065 BB     .012
 17.56        25915 BB     .014
 18.04       304058 BB     .163
 18.23        20776 BB     .011
 18.75         2016 BB     .001
```

```
  18.96        6751 BB     .004
  19.20        1468 BB 7.9E- 4
  19.39       10975 BB     .006
  19.57        5322 BB     .003
  19.75        9215 BB     .005
  20.10       17399 BB     .009
  20.18       29562 BB     .016
  20.43        3128 BB     .002

REPORT:      30.21  (CONTINUED)     PAGE:  2

   RT         AREA        AREA %       NAME

  20.50        8004 BB     .004
  20.58        8502 BB     .005
  20.68       14335 BB     .008
  21.11        3841 BB     .002
  21.28       57212 BB     .031
  21.44       83834 BB     .045
  21.72        1056 BB 5.7E- 4
  22.00        7507 BB     .004
  22.15        4604 BB     .002
  22.20        1602 BB 8.6E- 4
  22.44       28127 BB     .015
  22.52        2406 BB     .001
  22.63       12604 BB     .007
  22.82      279629 BB     .150
  23.03        7044 BB     .004
  23.23        2544 BB     .001
  23.27        3739 BB     .002
  23.41        6425 BB     .003
  23.62      284319 BB     .152
  23.80       10046 BB     .005
  24.08        6634 BB     .004
  24.24        2641 BB     .001
  24.34       27340 BB     .015
  24.55        1317 BB 7.1E- 4
  24.64        6273 BB     .003
  24.77       22746 BB     .012
  24.96        2368 BB     .001
  25.14        7482 BB     .004
  25.34        2528 BB     .001
  25.52       80534 BB     .043
  25.75        6265 BB     .003
  25.88       15507 BB     .008
  25.99       12401 BB     .007
  26.25       13155 BB     .007
  26.65        8599 BB     .005
  26.92         768 BB 4.1E- 4
  27.05       26984 BB     .014
  27.33       43157 BB     .023
  27.65       23645 BB     .013
  27.82       44482 BB     .024
  28.03       16056 BB     .009
  28.20         2796 BB     .001
  28.37         8323 BB     .004
  28.56         1063 BB 5.7E- 4
  28.66       107950 BB     .058
  28.83       204965 BB     .110
  29.10         2986 BB     .002
  29.18         2066 BB     .001
  29.53         8141 BB     .004
  29.65         4313 BB     .002
  29.89          662 BB 3.6E- 4
  30.20         2005 BB     .001
  30.32         3528 BB     .002
  30.47        38906 BB     .021
  30.60        11051 BB     .006
  30.75         2505 BB     .001

REPORT:     30.21  (CONTINUED)     PAGE:  3

   RT        AREA         AREA %       NAME

  30.79         1051 BB 5.6E- 4
  30.85         7102 BB     .004
  30.97        29232 BB     .016
  31.29        31305 BB     .017
  31.46         8136 BB     .004
  31.65          834 BB 4.5E- 4
  31.86         1445 BB 7.7E- 4
  32.05        10352 BB     .006
  32.19         1657 BB 8.9E- 4
  32.33         6980 BB     .004
  32.51         2499 BB     .001
  32.56         1184 BB 6.3E- 4
  32.66          590 BB 3.2E- 4
  32.92       302095 BB     .162
  33.28        25332 BB     .014
  33.51         1293 BB 6.9E- 4
  33.55          547 BB 2.9E- 4
  33.71         3115 BB     .002
  33.82        86892 BB     .047
  34.02       161113 BB     .086
  34.32       110033 BB     .059
  34.41         8222 BB     .004
  34.57         5485 BB     .003
  34.95         9399 BB     .005
  35.05         3775 BB     .002
  35.28         4072 BB     .002
  35.34         1183 BB 6.3E- 4
  35.57         1833 BB 9.8E- 4
  35.62          599 BB 3.2E- 4
  35.72         9952 BB     .005
  35.93         1031 BB 5.5E- 4
  36.28         2163 BB     .001
```



```
 36.41         2583 BB    .001
 36.66          701 BB 3.8E- 4
 36.78         1680 BB 9.0E- 4
 37.14       146924 BB    .079
 37.52         7469 BB    .004
 37.69         1983 BB    .001
 37.90        18695 BB    .010
 38.22        65979 BB    .035
 38.48         9499 BB    .005
 38.79          546 BB 2.9E- 4
 38.94         4781 BB    .003
 39.10         5506 BB    .003
 39.34        69137 BB    .037
 39.99         2499 BB    .001
 40.80         9585 BB    .005
 41.02          555 BB 3.0E- 4
 41.21          806 BB 4.3E- 4
 41.65          961 BB 5.2E- 4
 41.85          702 BB 3.8E- 4
 42.27         4056 BB    .002
 42.61          829 BB 4.4E- 4
 42.85         9412 BB    .005
 45.69          525 BB 2.8E- 4
 46.41        12229 BB    .007

REPORT:    30.21  (CONTINUED)    PAGE:  4

   RT        AREA        AREA %       NAME

 46.99         2212 BB    .001
 47.88          516 BB 2.8E- 4
 48.90          531 BB 2.8E- 4
 49.19          745 BB 4.0E- 4
 50.02         2187 BB    .001

TOTAL AREA =    186506205        TOTAL AREA % =    100.000

PROCESSED DATA FILE: P0          RAW DATA FILE: S2232F
```

Final processed file of G3.2 fraction in which retention time is replaced by the aromatic retention time and the peak area by concentration (relative to the co-injected 1,1'-binaphthyl). A few compounds also are identified by name in the third column.

FILE: SFE23B

SAMPLE: 2-23SG3.2+BI INJECTED at 11:39:41 ON MAR 31, 1980

RAW FILE: T2232F

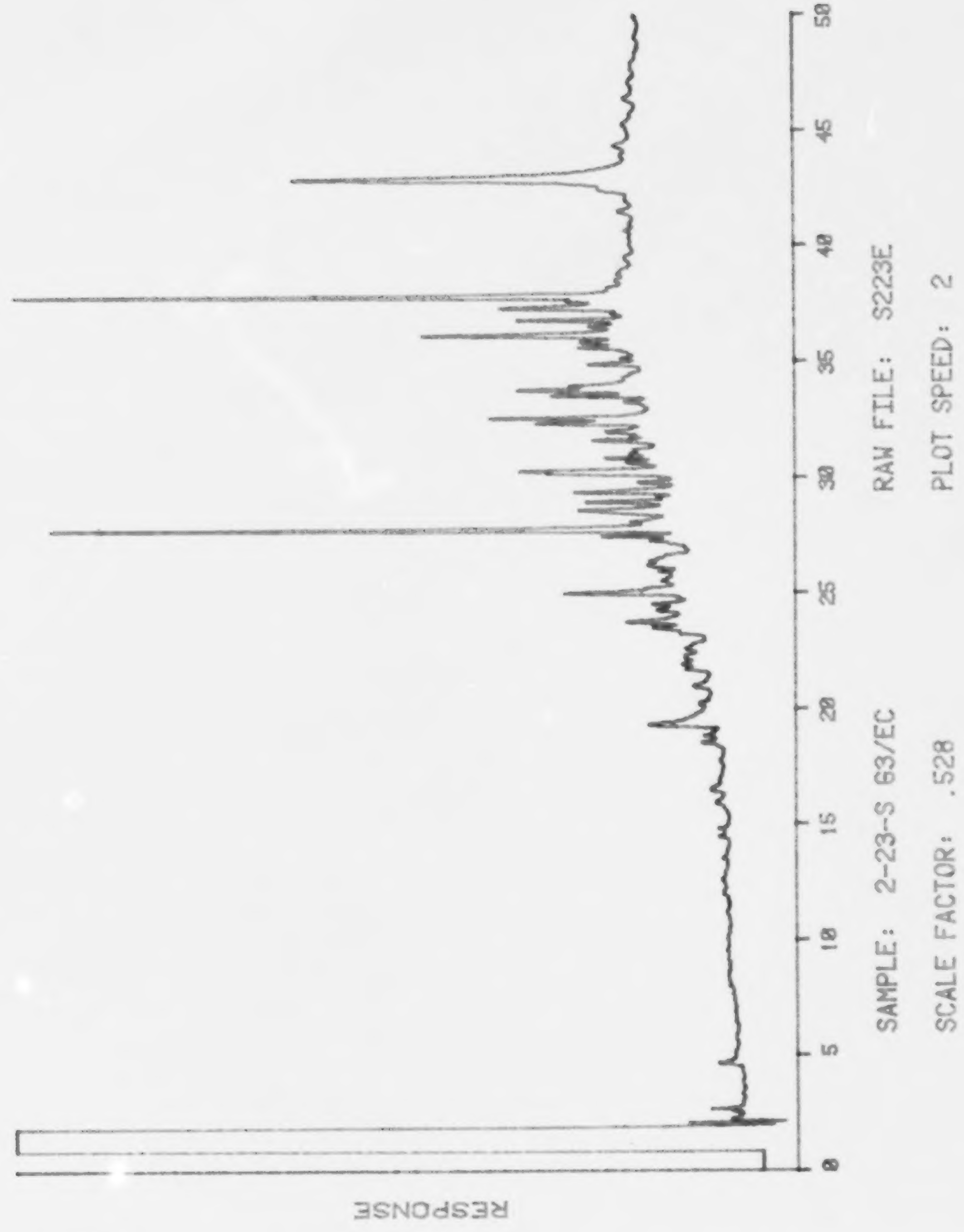
```
SAMPLE DRY WT: 75 g   MIN CONC CUTOFF: 1 ppb

VOL INJECTED: 1.3 uL   TOTAL VOL: .25 mL   VOL BEFORE GPC: 2.8 mL

COINJECTED ISTD: 1,1'-Binaphthyl  CONC:  40 ng/uL   VOL: .9 uL

RESPONSE FACTOR: 2275.94 uV-sec/ng

MARKER                   RET INDEX      PEAK #         RET TIME

Naphthalene              0                   0         10
Biphenyl                 100                 7         10.43
Phenanthrene             200                 31        18.01
Pyrene                   300                 58        23.62
Chrysene                 400                 85        28.84
Perylene                 500                 117       34.34
Benzo(ghi)perylene       600                 142       39.38


RET INDEX      CONC IN 1,1'-Binaphthyl EQUIV.

***            262291.
***            7911.14
***            4.43396
***            176.87
***            59.6724
***            81.0517
100            4.46645        Biphenyl
104.866        11.4679
108.601        24.56
113.536        4.53428
115.941        20.648         1,4-/1,5-DMN
125.595        3.62353
127.488        2.56431        Acenaphthene
131.931        5.59447        3-Methylbiphenyl
135.147        23.7833
143.254        12.9465
147.004        12.3642
151.873        71.4369        Fluorene
158.703        1.81168
162.484        6.82604
166.059        19.7943
171.303        1.54747
174.579        3.97219
182.544        2.72842        1-Methylfluorene
183.8          1.67522        1-Methylfluorene
```

185.255	2.61378	
191.337	34.1231	
194.	39.2483	Dibenzothiophene
200	439.021	Phenanthrene
203.36	33.1806	Anthracene
216.072	4.92573	
224.038	18.5186	
227.592	7.60922	
230.545	16.4719	
236.613	32.0161	
238.16	51.5565	
242.706	6.91387	
243.965	12.0345	
250.679	1.20916	
255.065	8.05395	
260.697	171.253	
265.756	2.36128	
267.832	1.80399	
270.595	13.4331	
273.448	7.54317	
278.495	47.1252	
279.974	4.29349	
282.105	24.2433	
285.531	521.783	Fluoranthene
289.147	12.5837	
292.598	7.93387	
293.652	6.98592	
295.914	13.7743	
297.413	2.63167	
300	479.568	Pyrene
303.191	32.7784	
308.73	14.1187	
312.019	6.01425	
313.705	53.7959	
319.677	21.3866	
322.088	42.6761	
325.718	5.64948	
330.172	146.344	Benzo(a)fluorene
332.809	7.08624	
336.479	147.602	Benzo(b)fluorene
340.747	11.2746	
343.35	31.0318	
345.473	27.4495	
350.902	23.7711	
356.702	1.01986	
358.211	8.0133	
365.851	59.7468	
373.253	123.077	1,1'-Binaphthyl
377.581	41.7036	

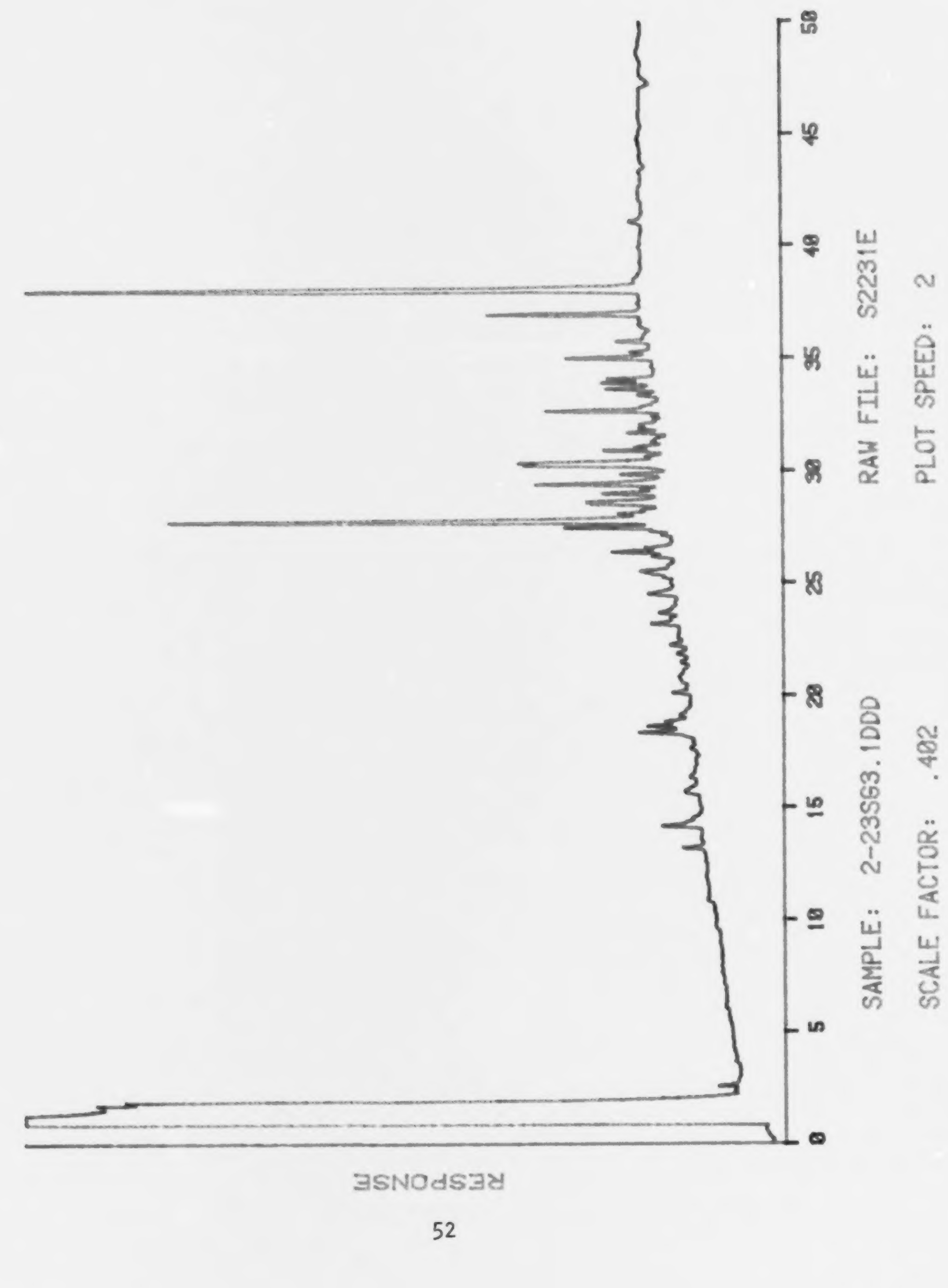
380.263	13.9573	
384.799	21.4479	
387.691	8.51215	
391.308	16.7473	9-Phenylanthracene
394.444	3.66348	
397.009	227.807	Benz(a)anthracene
400	321.807	Chrysene
404.751	1.72536	
406.181	3.75415	
412.775	18.765	
414.651	10.3121	
418.959	25.4159	
424.661	16.158	
427.042	8.95568	
429.698	83.6682	
432.149	24.0938	
434.661	15.7562	
436.61	14.5442	
438.647	59.8548	
444.535	65.1031	
447.494	17.4571	
450.886	13.1515	
454.643	9.34617	
458.02	21.5609	
461.3	3.33869	
463.49	12.6185	
466.251	1.34475	
467.844	1.26495	
469.677	5.01727	
474.699	25.5073	Benzo(b)fluoranthene
480.737	56.3829	
484.932	3.00885	
485.739	1.87111	
488.458	1.62863	
490.982	187.317	Benzo(e)pyrene
494.226	238.363	Benzo(a)pyrene
500	288.597	Perylene
504.758	10.7866	
507.715	7.77634	
512.176	14.7415	
514.273	9.09818	
518.569	2.75107	
524.224	4.20597	
525.244	1.0804	
527.636	21.7649	
531.528	3.51761	
537.403	2.83563	
541.294	9.57168	
546.09	2.31925	
547.997	2.31763	

```
555.762        262.746
563.993        12.6196
566.861        3.27008
571.044        44.3611
578.135        155.151        Indeno(123-cd)pyrene
582.743        40.3496
591.32         10.985
594.609        14.1776
600            136.336        Benzo(ghi)perylene
***            1.76528
***            6.90622
***            1.15421
***            1.90216
***            22.7905
***            3.10001
***            8.08512
***            3.15866
***            1.30445
***            1.20416
***            1.30943
***            4.43087
***            1.14917
***            2.43756
***            8.60505
***            1.48436
***            1.72531
***            6.19396
***            11.998

END OF FILE
```

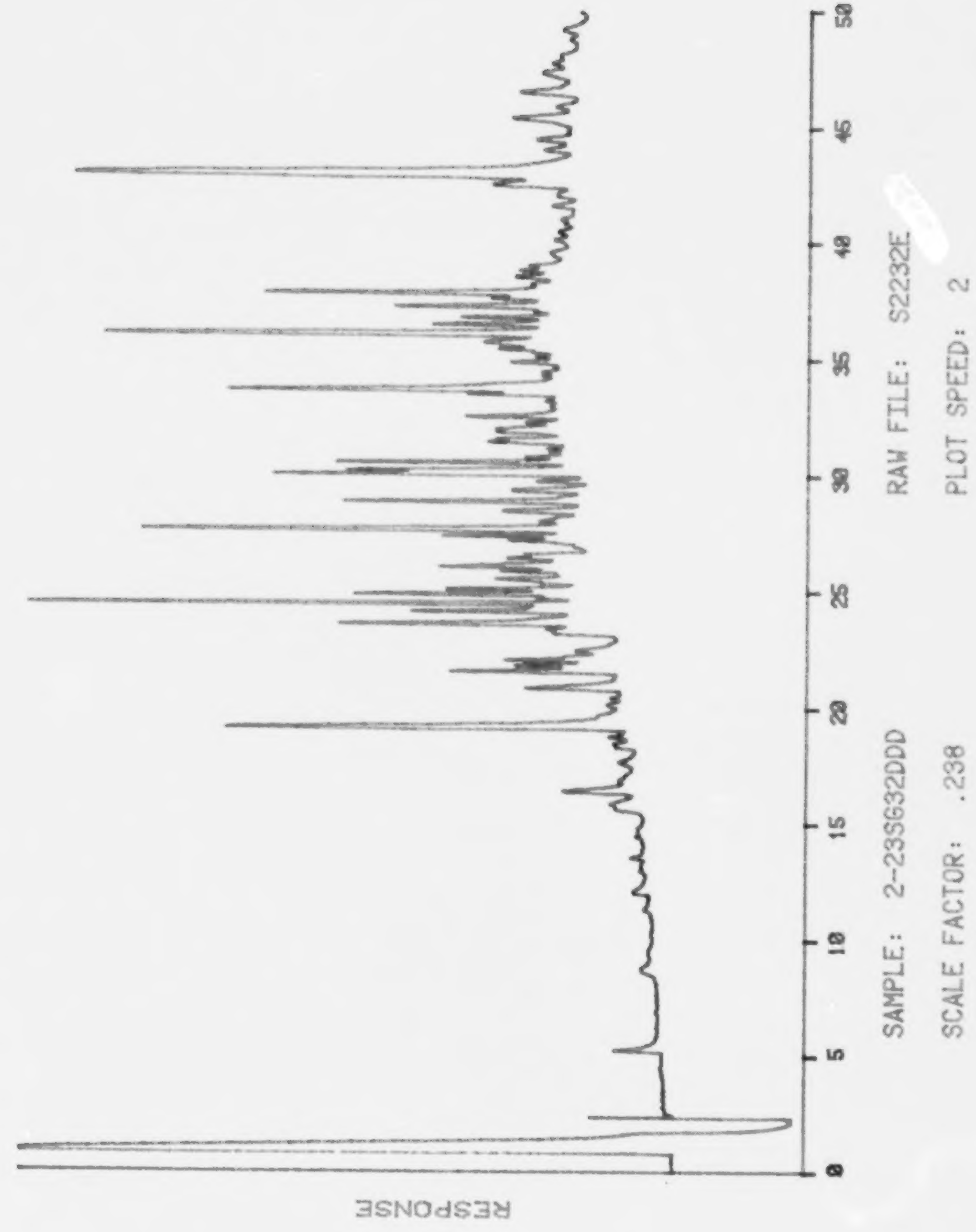
Computer reconstructed ECD gas chromatogram of G3 fraction with o,p'-DDD co-injected as quantitative standard.


RESPONSE
0
5
10
15
20
25
30
35
40
45
50
SAMPLE: 2-23-S 63/EC
RAW FILE: S223E
SCALE FACTOR: .528
PLOT SPEED: 2

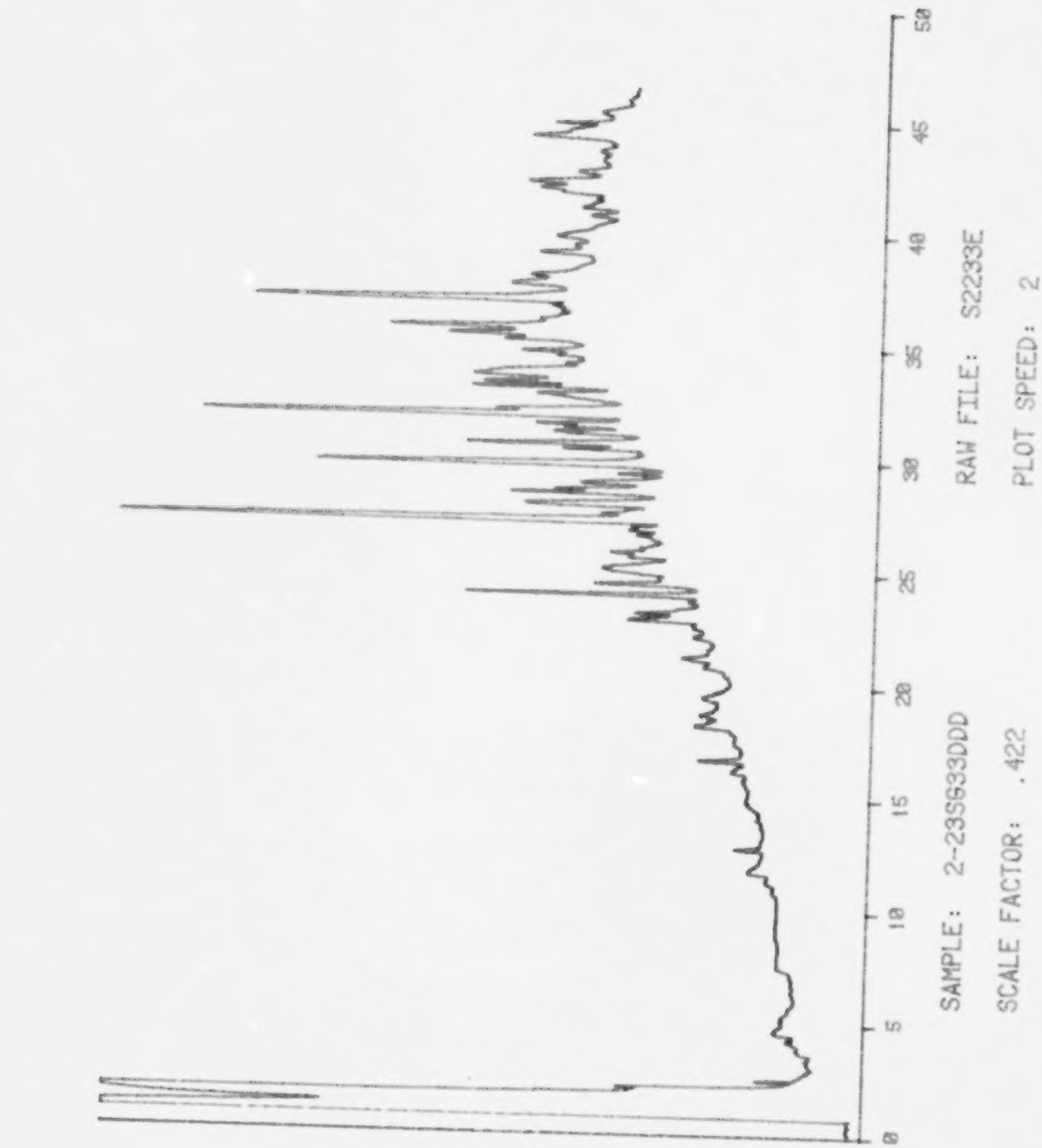
Computer reconstructed ECD gas chromatogram of G3.1 fraction with o,p'-DDD co-injected as quantitative standard.


RESPONSE
0
5
10
15
20
25
30
35
40
45
50
SAMPLE: 2-23S63.1DDD
RAW FILE: S2231E
SCALE FACTOR: .402
PLOT SPEED: 2

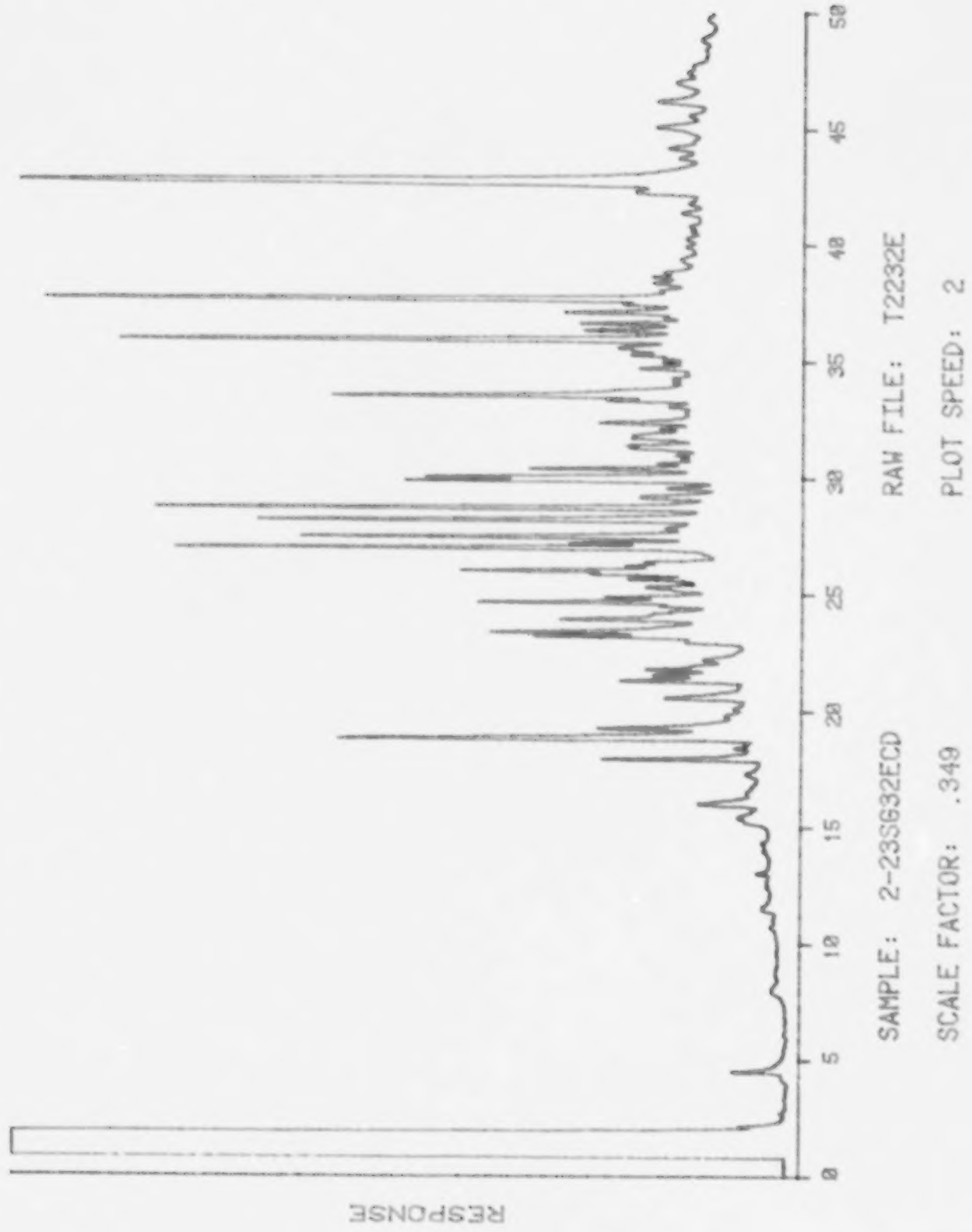
Computer reconstructed ECD gas chromatogram of G3.2 fraction with o,p'-DDD co-injected as quantitative standard.


SAMPLE: 2-23S632DDD
RAW FILE: S2232E
SCALE FACTOR: .238
PLOT SPEED: 2
RESPONSE
0
5
10
15
20
25
30
35
40
45
50

Computer reconstructed ECD gas chromatogram of G3.3 fraction with o,p'-DDD co-injected as quantitative standard.


RESPONSE
0
5
10
15
20
25
30
35
40
45
50
SAMPLE: 2-23S633DDD
SCALE FACTOR: .422
RAW FILE: S2233E
PLOT SPEED: 2

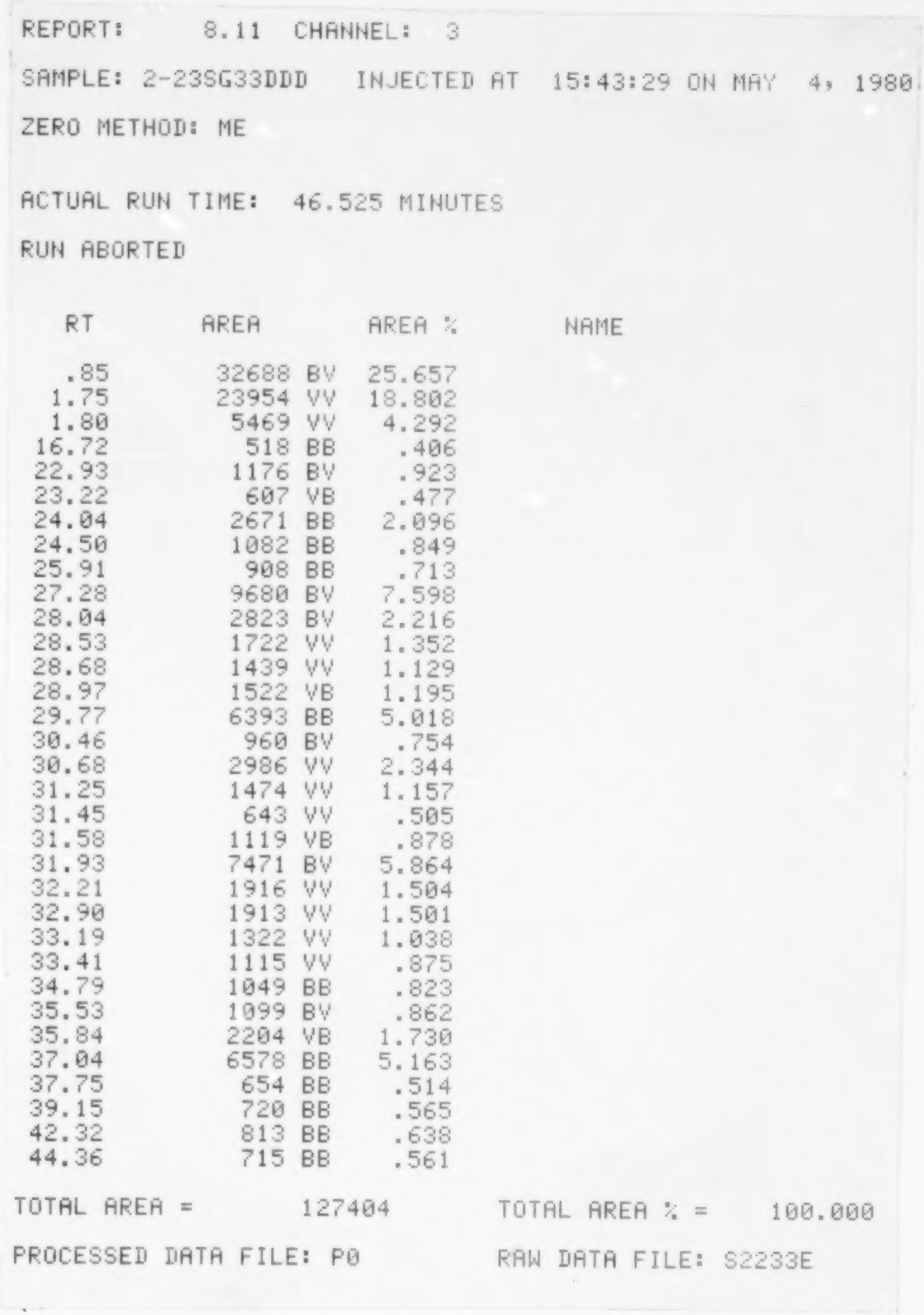
Computer reconstructed ECD gas chromatogram of G3.2 fraction with pesticide retention standard added.


SAMPLE: 2-23SG32ECD
RAW FILE: T2232E
SCALE FACTOR: .349
PLOT SPEED: 2
RESPONSE
0
5
10
15
20
25
30
35
40
45
50

First stage processed ECD file of G3.2 fraction with o,p'-DDD co-injected as quantitative standard.

```
REPORT:     45.11  CHANNEL:  3

SAMPLE: 2-23SG32DDD   INJECTED AT  12:21:51 ON MAR 31, 1980

ZERO METHOD: ME


ACTUAL RUN TIME:  60.017 MINUTES


   RT          AREA          AREA %          NAME

   .86        54593 BV   19.917
  2.37          664 VB     .242
  5.28          749 BB     .273
 16.43         2358 BB     .860
 19.19        14344 BB    5.233
 20.90         3281 BB    1.197
 21.62         4074 BV    1.486
 21.87         2763 VV    1.008
 22.11         3380 VV    1.233
 22.49         1245 VB     .454
 23.42         2519 BV     .919
 23.65         7172 VV    2.617
 24.19         2607 VB     .951
 24.51         9473 BV    3.456
 24.77          549 VV     .200
 24.93         4455 VV    1.625
 25.15         2469 VV     .901
 25.59         2059 VB     .751
 25.93          984 BV     .359
 26.11         3034 VV    1.107
 27.26         1982 BV     .723
 27.44         2481 VV     .905
 27.72        12118 VV    4.421
 28.07          535 VB     .195
 28.52         2236 BV     .816
 28.93         5471 VV    1.996
 29.41         2462 VV     .898
 29.80         1017 VV     .371
 30.10         6414 VV    2.340
 30.26         5563 VV    2.029
 30.62         4743 VV    1.730
 30.85          855 VV     .312
 31.51         1577 BV     .575
 31.63         1195 VV     .436
 31.94         1345 VV     .491
 32.04         1736 VV     .633
 32.32          688 VV     .251
 32.60         2184 VB     .797
 33.55         1485 BV     .542
 33.74        11301 VB    4.123
 34.93        1088 BV    .397
 35.49        1587 VV    .579
 35.78        3092 VV   1.128
 36.13       13996 VV   5.106
 36.54        2681 VV    .978
 36.84        1648 VV    .601
 37.33        3897 VV   1.422
 37.69        1074 VV    .392

REPORT:    45.11  (CONTINUED)    PAGE:  2

  RT         AREA        AREA %        NAME

 37.91        6544 VB   2.387
 38.60         739 BV    .270
 41.65         519 BB    .190
 42.55        3282 BV   1.197
 43.04       28463 VB  10.384
 44.06         637 BB    .232
 44.53        1027 BB    .375
 45.45        2724 BB    .994
 46.57        2019 BB    .737
 54.46        5028 BB   1.834
 55.72        3897 BB   1.422

TOTAL AREA =        274106       TOTAL AREA % =    100.000

PROCESSED DATA FILE: PG3.2       RAW DATA FILE: S2232E
```

First stage processed ECD file of G3.3 fraction with o,p'-DDD co-injected as quantitative standard.



```
REPORT:     8.11  CHANNEL:  3

SAMPLE: 2-23SG33DDD   INJECTED AT  15:43:29 ON MAY  4, 1980

ZERO METHOD: ME


ACTUAL RUN TIME:  46.525 MINUTES

RUN ABORTED


   RT        AREA        AREA %       NAME

   .85       32688 BV  25.657
  1.75       23954 VV  18.802
  1.80        5469 VV   4.292
 16.72         518 BB    .406
 22.93        1176 BV    .923
 23.22         607 VB    .477
 24.04        2671 BB   2.096
 24.50        1082 BB    .849
 25.91         908 BB    .713
 27.28        9680 BV   7.598
 28.04        2823 BV   2.216
 28.53        1722 VV   1.352
 28.68        1439 VV   1.129
 28.97        1522 VB   1.195
 29.77        6393 BB   5.018
 30.46         960 BV    .754
 30.68        2986 VV   2.344
 31.25        1474 VV   1.157
 31.45         643 VV    .505
 31.58        1119 VB    .878
 31.93        7471 BV   5.864
 32.21        1916 VV   1.504
 32.90        1913 VV   1.501
 33.19        1322 VV   1.038
 33.41        1115 VV    .875
 34.79        1049 BB    .823
 35.53        1099 BV    .862
 35.84        2204 VB   1.730
 37.04        6578 BB   5.163
 37.75         654 BB    .514
 39.15         720 BB    .565
 42.32         813 BB    .638
 44.36         715 BB    .561

TOTAL AREA =        127404       TOTAL AREA % =    100.000

PROCESSED DATA FILE: P0          RAW DATA FILE: S2233E
```

First stage processed file of G3.2 fraction
with pesticide retention standard co-injected.

```
REPORT:       2.31  CHANNEL:   3

SAMPLE: 2-23SG32ECD   INJECTED AT  14:14:12 ON APR  2, 1980

ZERO METHOD: ME


ACTUAL RUN TIME:  59.667 MINUTES

RUN ABORTED


   RT        AREA        AREA %        NAME

   .92        4148 BB    2.549
 16.02        1172 BB     .720
 17.97        2312 BB    1.421
 18.86        9232 BV    5.674
 19.30        3224 VB    1.981
 20.60        1887 BB    1.160
 21.35        2140 BV    1.315
 21.59        1443 VV     .887
 21.83        1552 VB     .954
 23.24        3578 BV    2.199
 23.41        4500 VV    2.766
 23.96        1567 VB     .963
 24.70        2654 BV    1.631
 24.91        1133 VV     .697
 25.35        1133 VB     .696
 25.69        1004 BV     .617
 25.90        1411 VV     .867
 26.05        3865 VV    2.376
 26.25        1191 VV     .732
 26.41         911 VB     .560
 27.02        7876 BV    4.841
 27.23        1721 VV    1.058
 27.51        6930 VB    4.259
 28.22        7345 BV    4.514
 28.75        8760 VV    5.384
 29.21        1587 VB     .975
 29.60         631 BV     .388
 29.92        4051 VV    2.490
 30.07        4600 VV    2.827
 30.43        2402 VV    1.476
 31.76        1906 VV    1.171
 32.42        1448 VB     .890
 33.38         959 BV     .589
 33.57        7642 VB    4.697
 34.76         617 BB     .379
 35.33         858 VV     .527
 35.62        1878 VV    1.155
 35.96        9994 VV    6.143
 36.37        1538 VV     .945
 36.67        1246 VB     .766
 37.15        1691 BV    1.039
 37.50         554 VV     .341
 37.72       11100 VB    6.822
 42.77       24531 BB   15.077
 46.24         784 BB     .482
TOTAL AREA =        162702         TOTAL AREA % =     100.000
PROCESSED DATA FILE: P0            RAW DATA FILE: T2232E
```

Final processed file of G3.2 fraction in which retention time has been replaced by the pesticide retention index and the peak area by concentration.

FILE: SEE23B

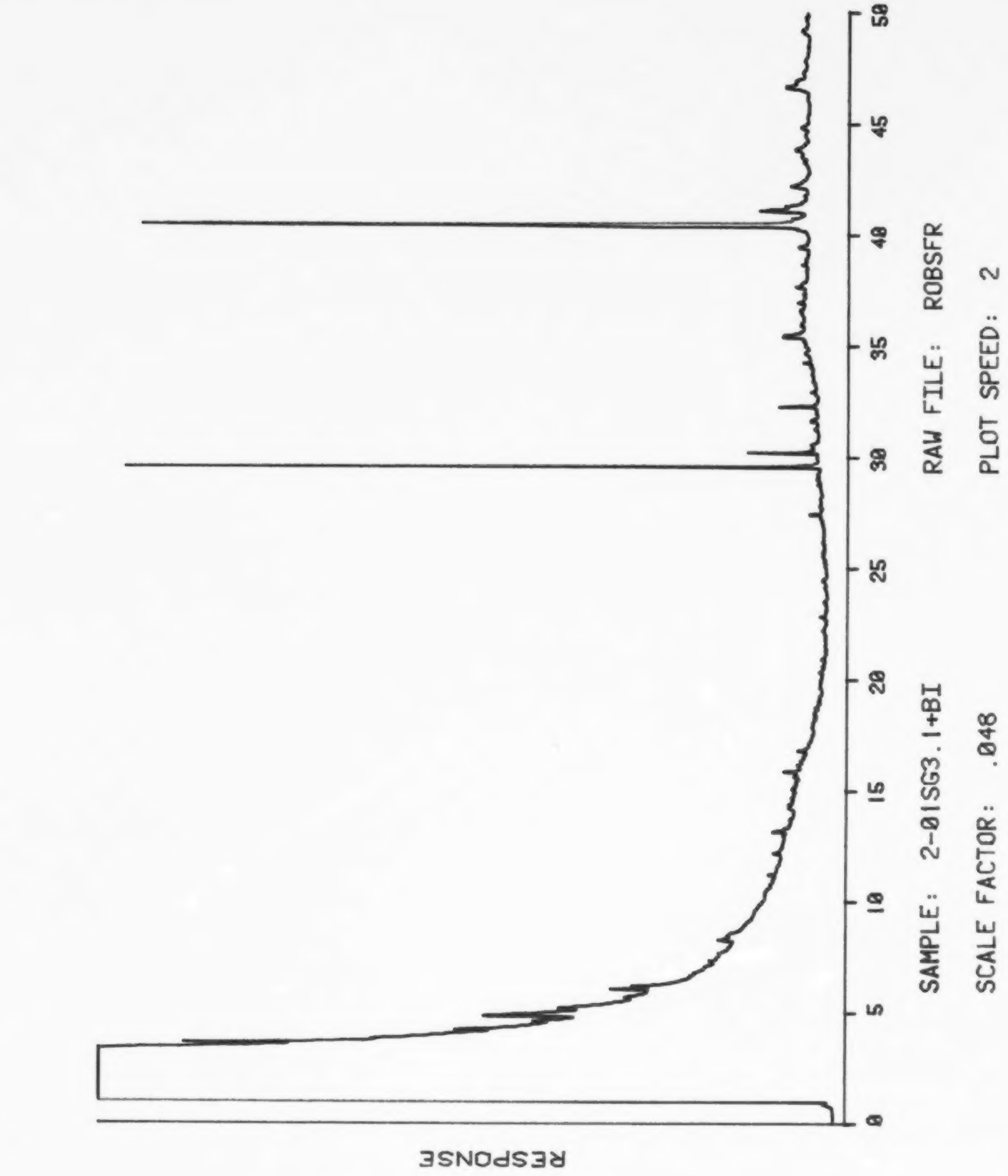
SAMPLE: 2-23SG32DDD. INJECTED AT 12:21:51 ON
MAR 31, 1980. RAW FILE: SS2232E

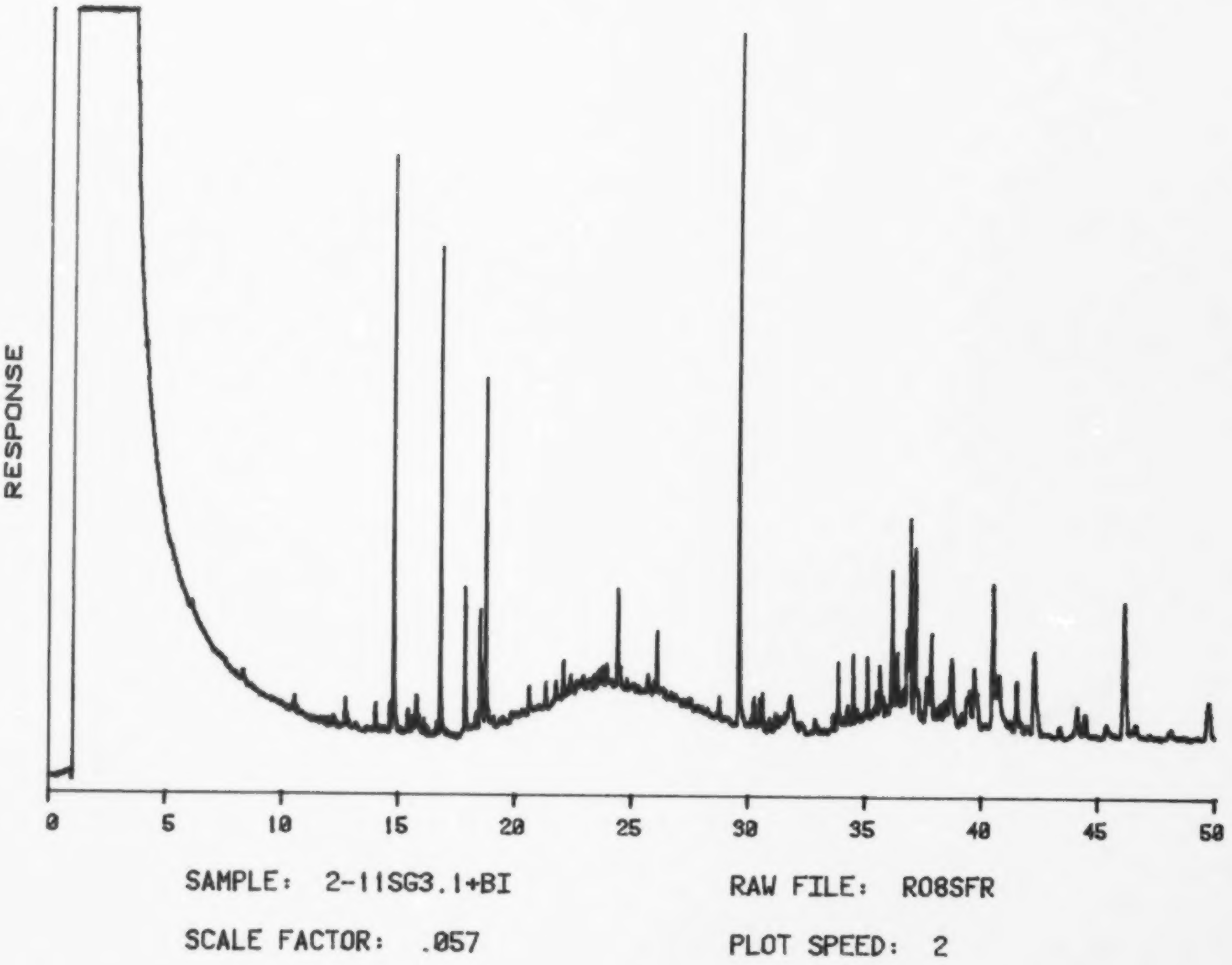
```
SAMPLE DRY WT: 75 g   MIN CONC CUTOFF: 1 ppb

VOL INJECTED: .8 uL   TOTAL VOL: 5 mL   VOL BEFORE GPC: 2.8 mL

COINJECTED ISTD: o,p'-DDD  CONC:  .54 ng/uL   VOL: .8 uL

RESPONSE FACTOR: 28051.9 uV-sec/ng

MARKER                    RET INDEX      PEAK #         RET TIME

a-BHC                     0                  0          18.18
o,p'-DDD                  100                23         27.72
Decachlorobiphenyl        200                49         37.91


RET INDEX      CONC IN o,p'-DDD EQUIV.

***            216.239
***            2.62875
***            2.96772
***            9.34133
110.63         56.8154
128.469        12.9958
136.065        16.1374
138.74         10.946
141.16         13.3893
145.205        4.92998
154.903        9.97805
157.346        28.4092
162.965        10.3254
166.395        37.5233
169.115        2.17294
170.786        17.6471
173.072        9.77939
177.726        8.15578
181.208        3.89717
183.189        12.0183
195.2          7.84931
197.113        9.62741
200            47.9999
203.462        2.12008
207.886        8.85723
211.85         21.6692
216.642        9.75377
220.398        4.02986
223.398        25.4051
224.969        22.0335
228.432        18.7875
230.735        3.38646
237.208        6.24724
238.35         4.73305
```

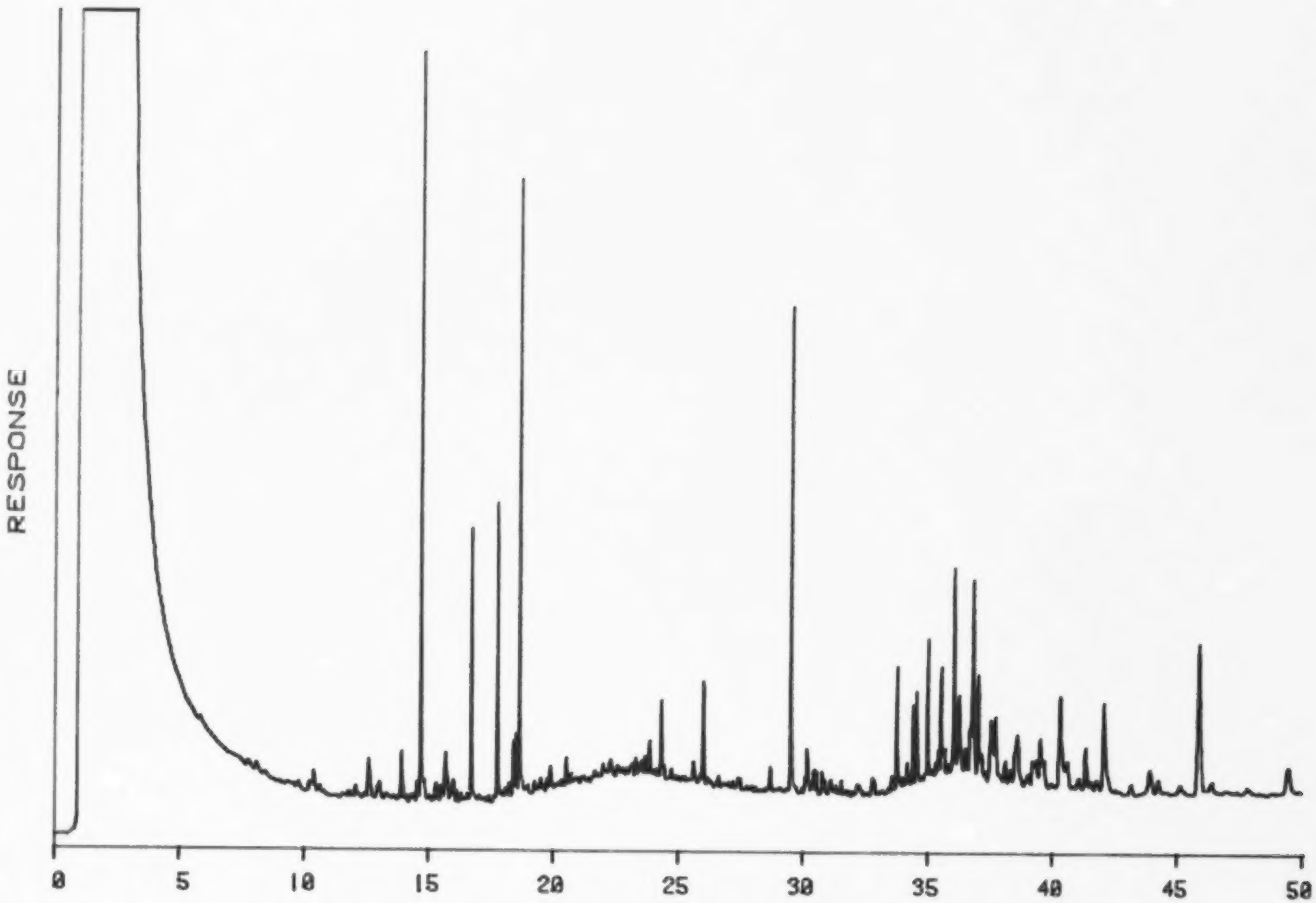
```
241.407            5.32793
242.441            6.87702
245.114            2.72412
247.861            8.65189
257.261            5.8832
259.067            44.7614
270.792            4.30787
276.296            6.28734
279.126            12.248
282.544            55.439
286.588            10.6189
289.539            6.52636
294.286            15.4369
297.812            4.25229
300                25.9198
***                2.92836
***                2.0577
***                12.9995
***                112.74
***                2.52137
***                4.06786
***                10.7878
***                7.99809
***                19.9155
***                15.4347

END OF FILE
```

APPENDIX II

Examples of computer reconstructed chromatograms for G3.1 fractions. All samples have 1,1'-binaphthyl co-injected as quantitative standard. Because of size discrimination from GPC, n-alkanes heavier than ~ n-C_{16} are alternated.


RESPONSE
0
5
10
15
20
25
30
35
40
45
50
SAMPLE: 2-01SG3.1+BI
RAW FILE: ROBSFR
SCALE FACTOR: .048
PLOT SPEED: 2


RESPONSE
0
5
10
15
20
25
30
35
40
45
50
SAMPLE: 2-11SG3.1+BI
RAW FILE: RO8SFR
SCALE FACTOR: .057
PLOT SPEED: 2

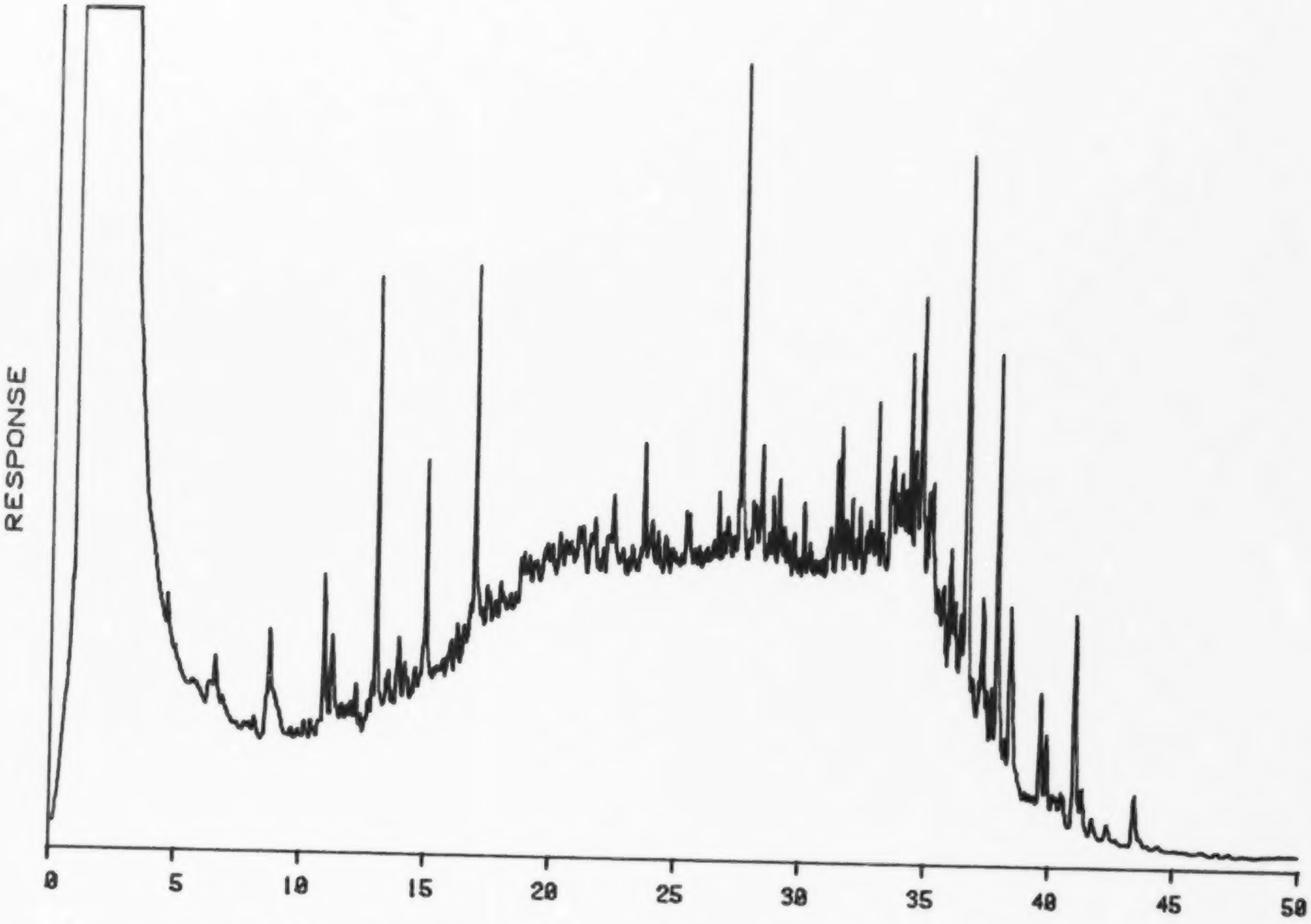


SAMPLE: 2-14SG3.1

SCALE FACTOR: .052

RAW FILE: RKDOFR

PLOT SPEED: 2

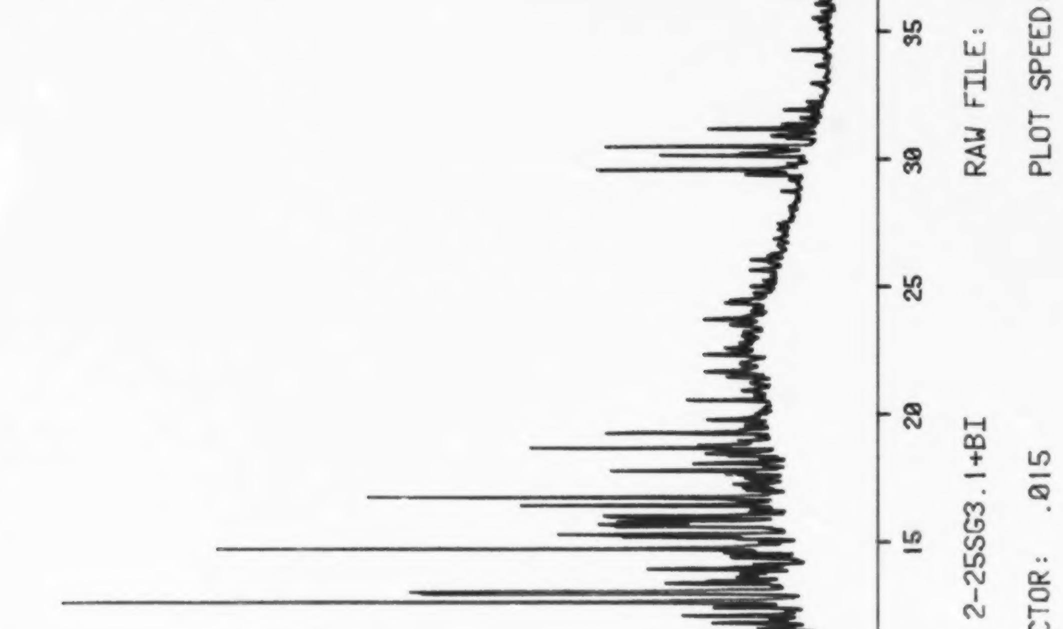


SAMPLE: 2-22-SG3.1+B

SCALE FACTOR: .029

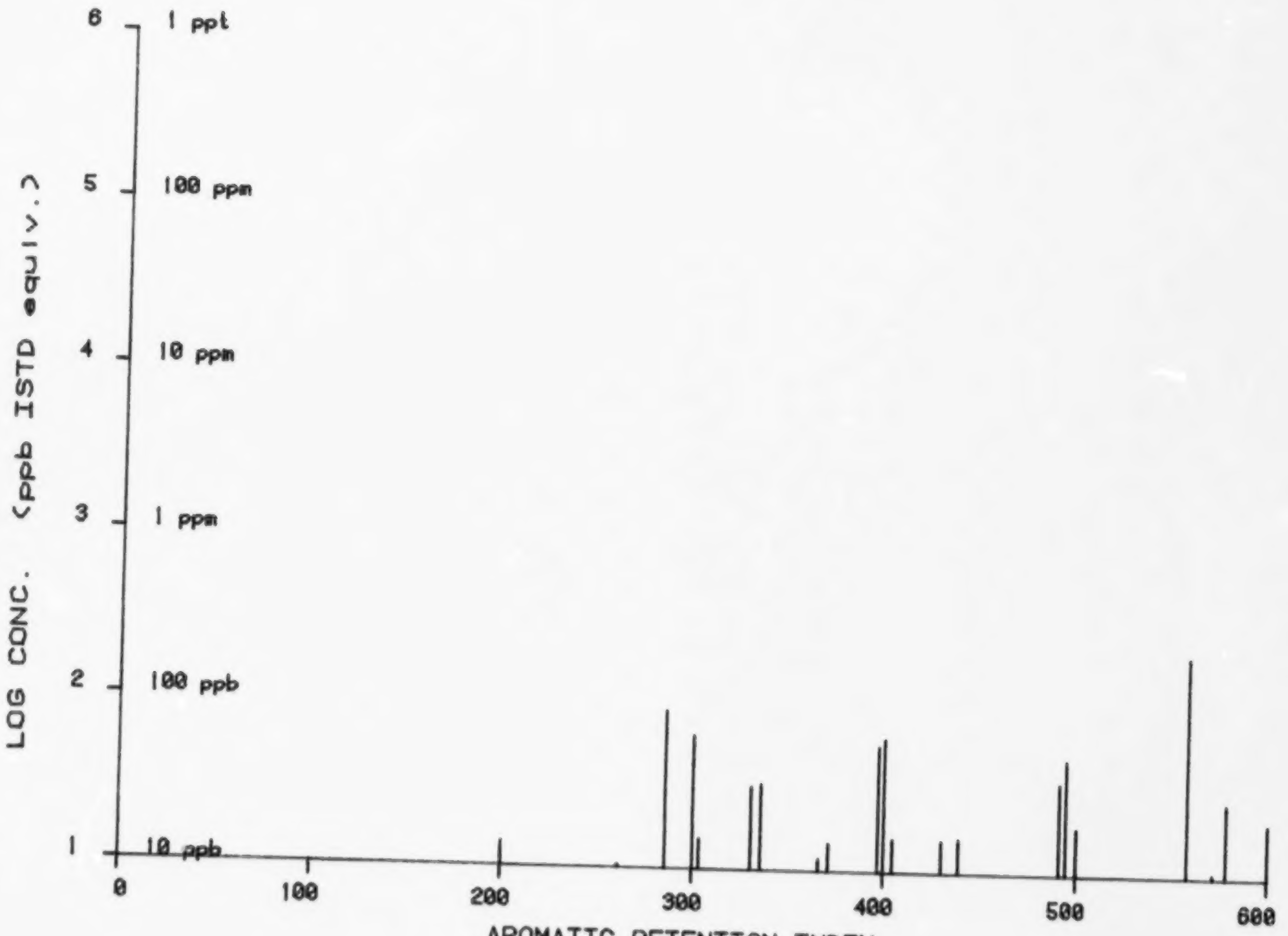
RAW FILE: RP4SFR

PLOT SPEED: 2

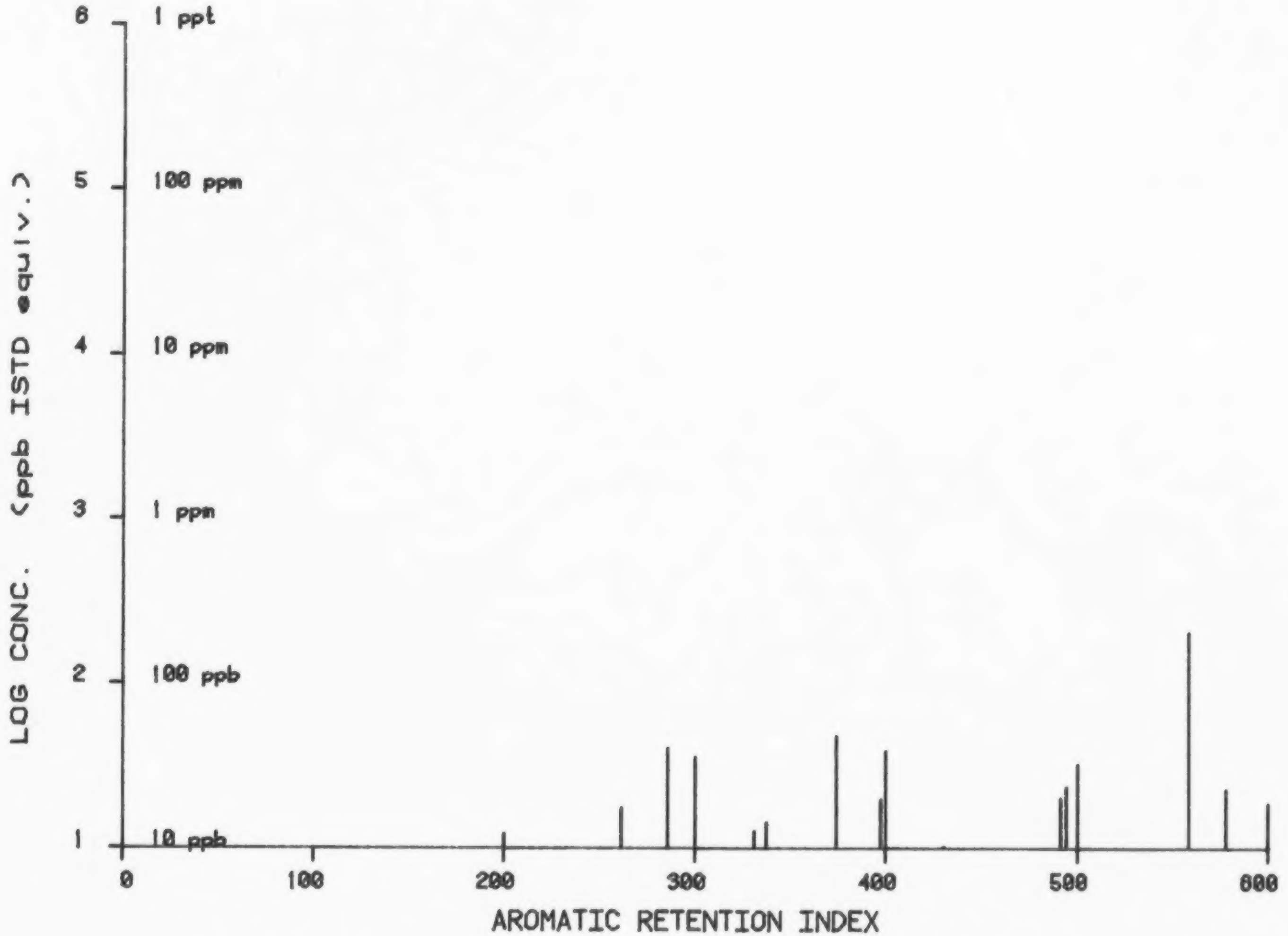

RESPONSE
0
5
10
15
20
25
30
35
40
45
50
SAMPLE: 2-25SG3.1+BI
SCALE FACTOR: .015
RAW FILE: RU6SFR
PLOT SPEED: 2

APPENDIX III

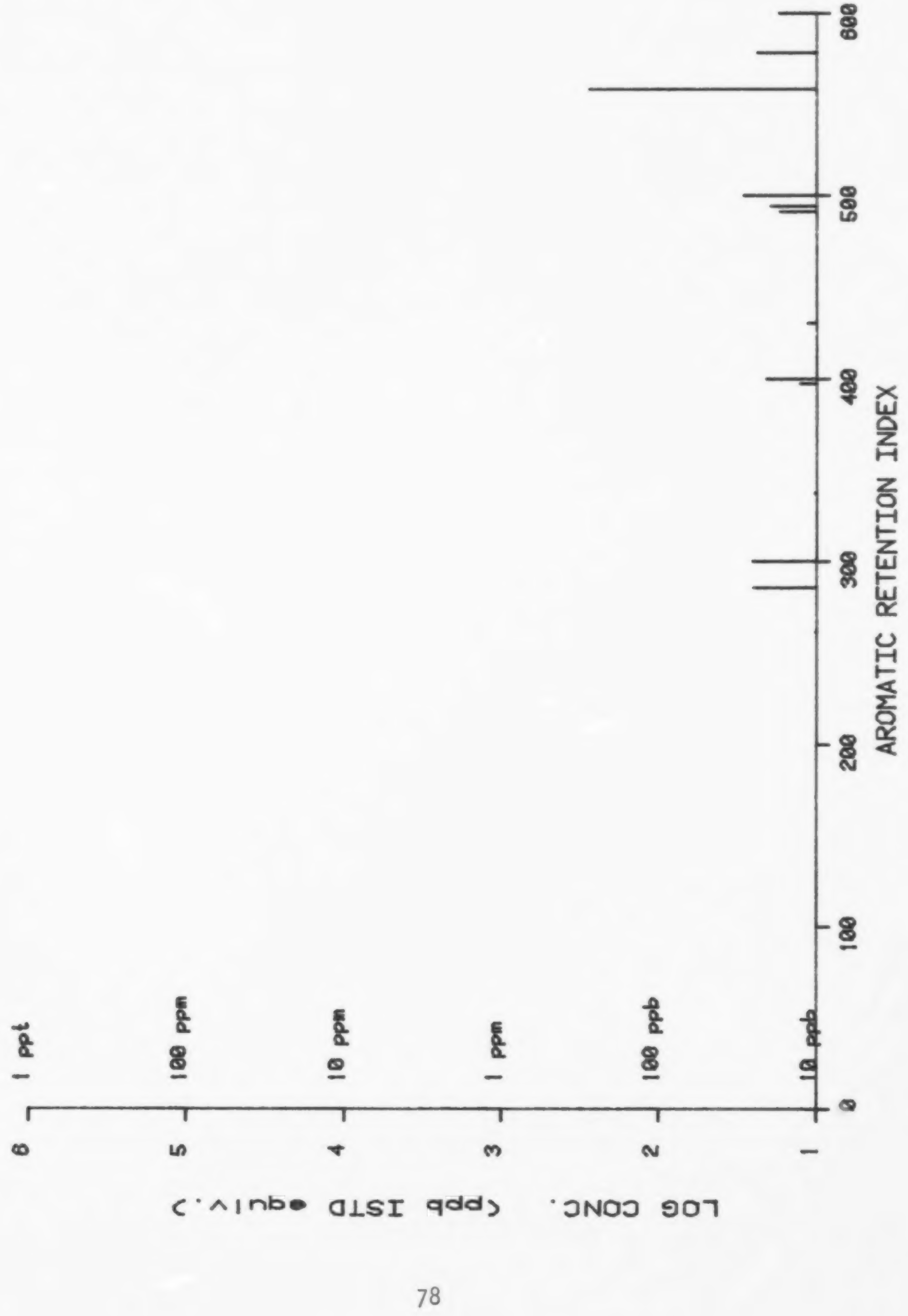
Bar graphs for sediment samples. The peak at ARI ~ 563 is p-quaterphenyl, an internal standard added to the sample.



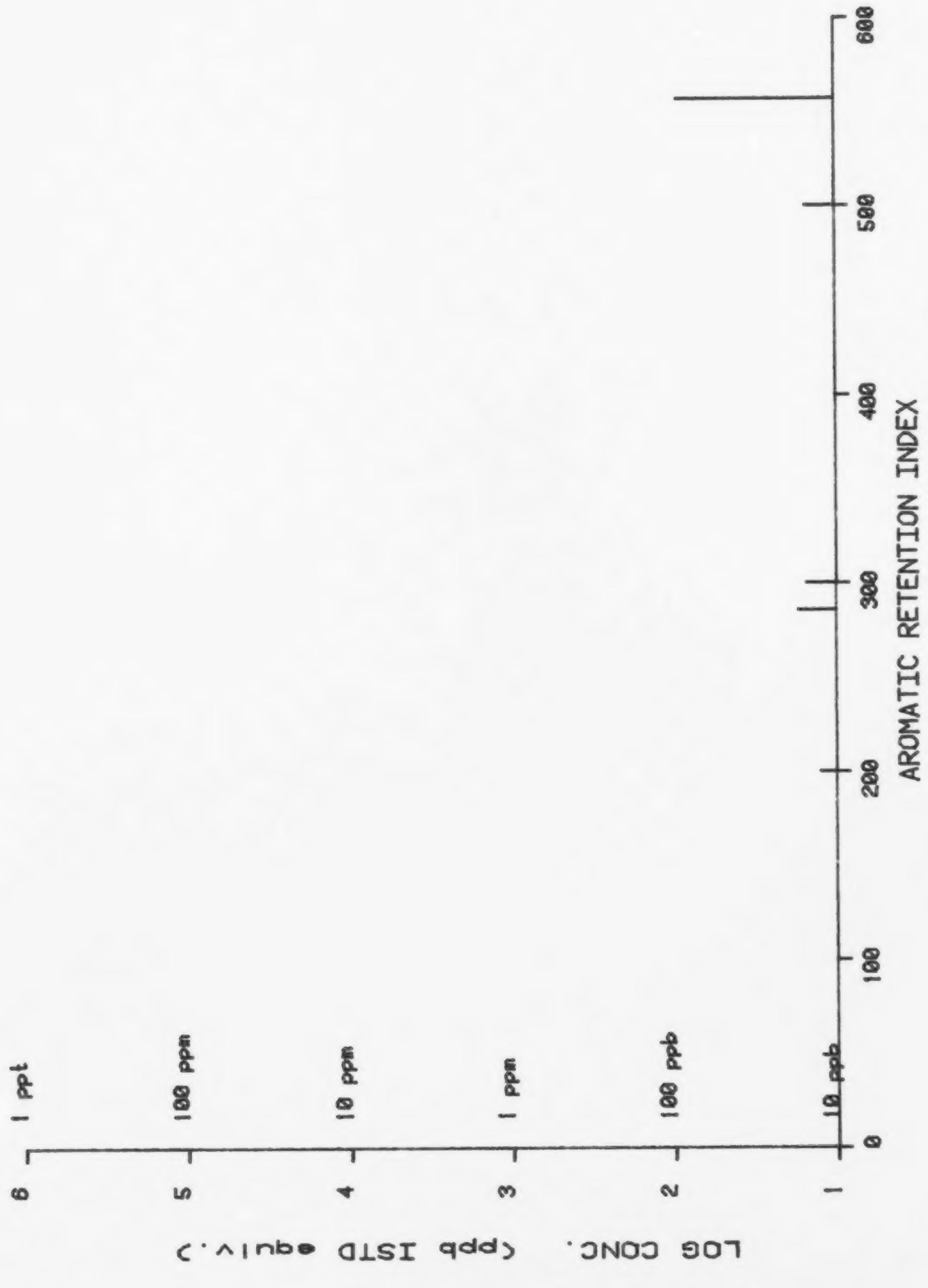
SEDIMENT, FID, STATION 01, SPRING 1979



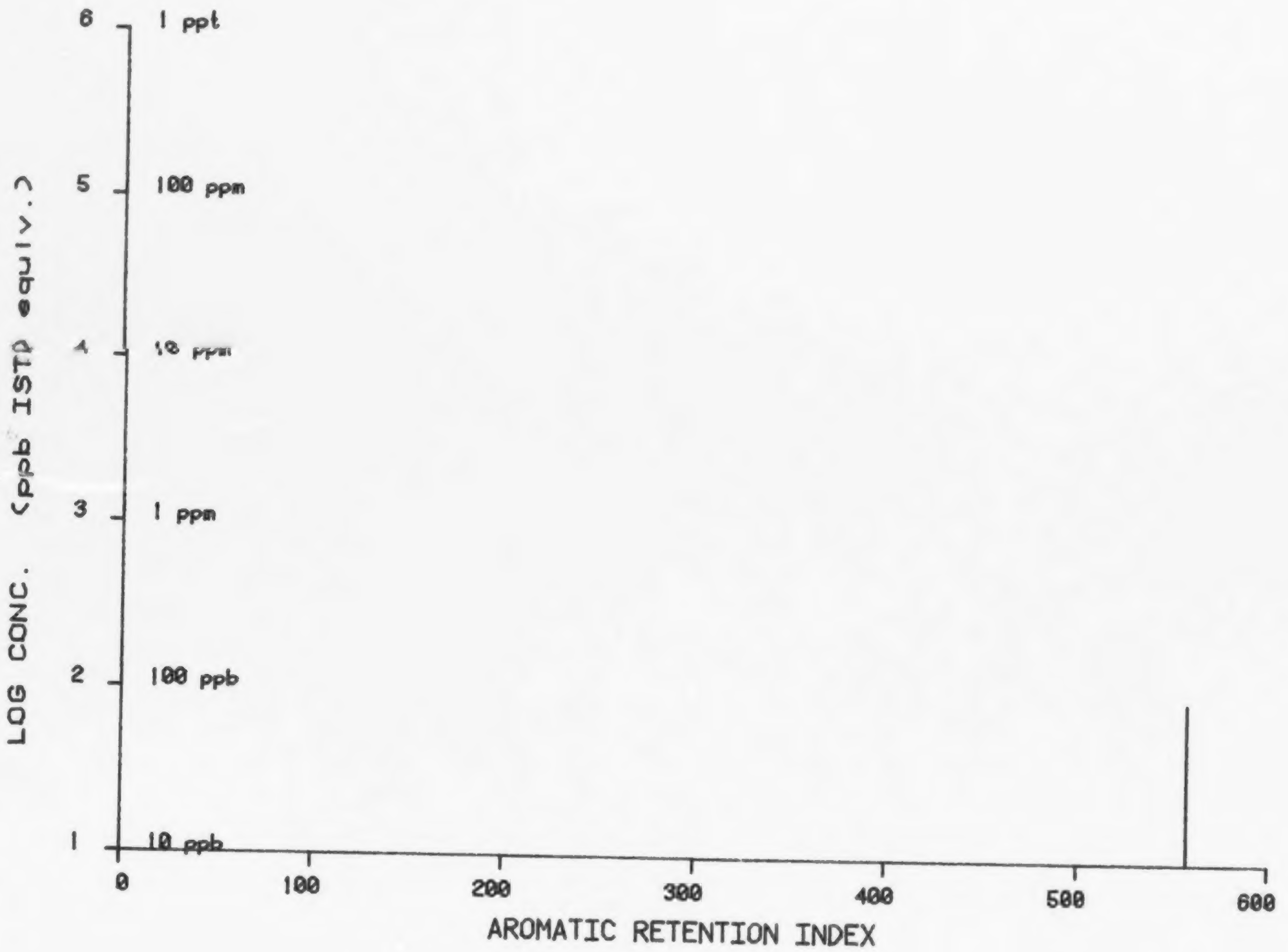
SEDIMENT, FID, STATION 03, SPRING 1979



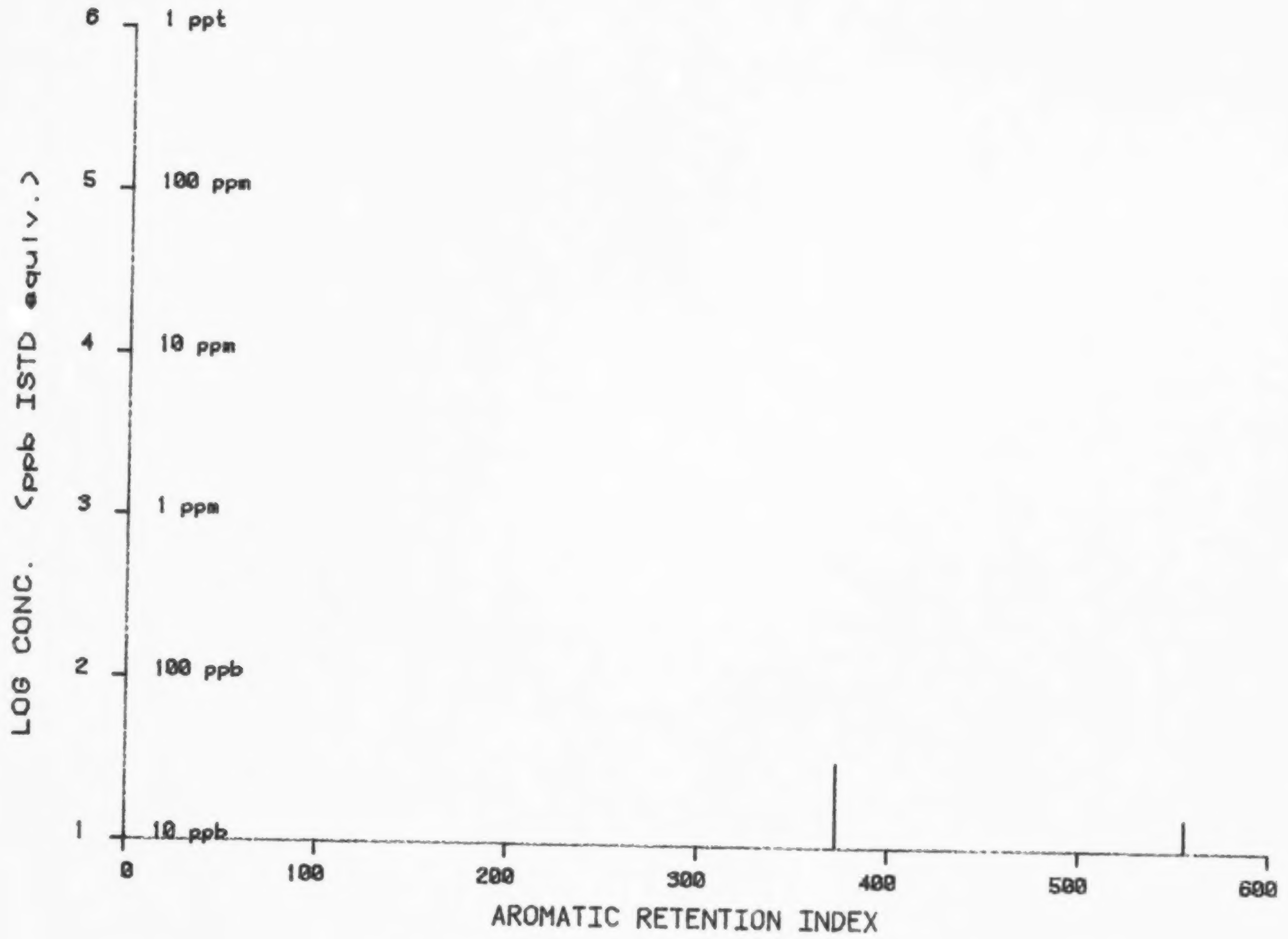
SEDIMENT, FID, STATION 05, SPRING 1979



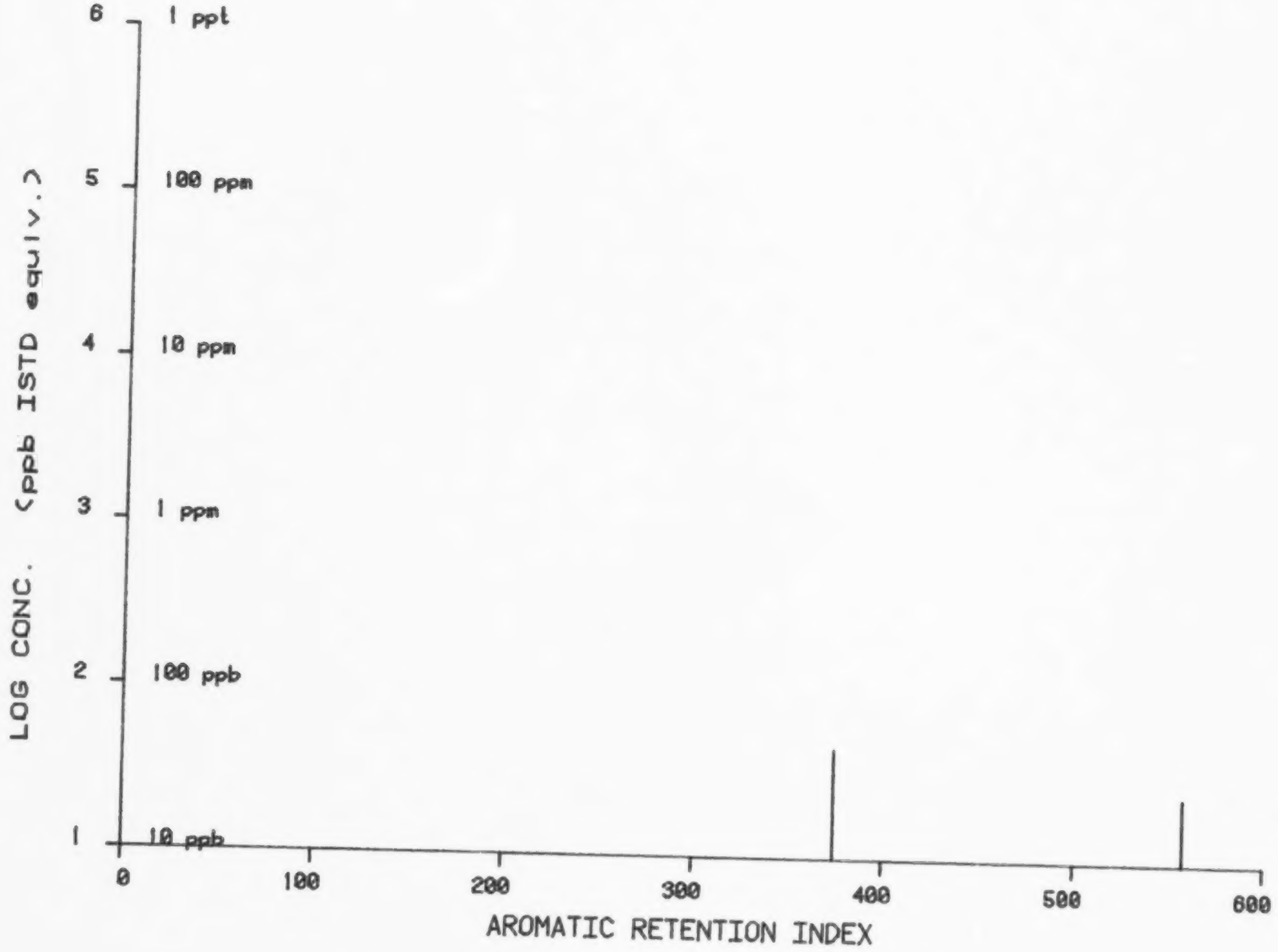
SEDIMENT, FID, STATION 08, SPRING 1979



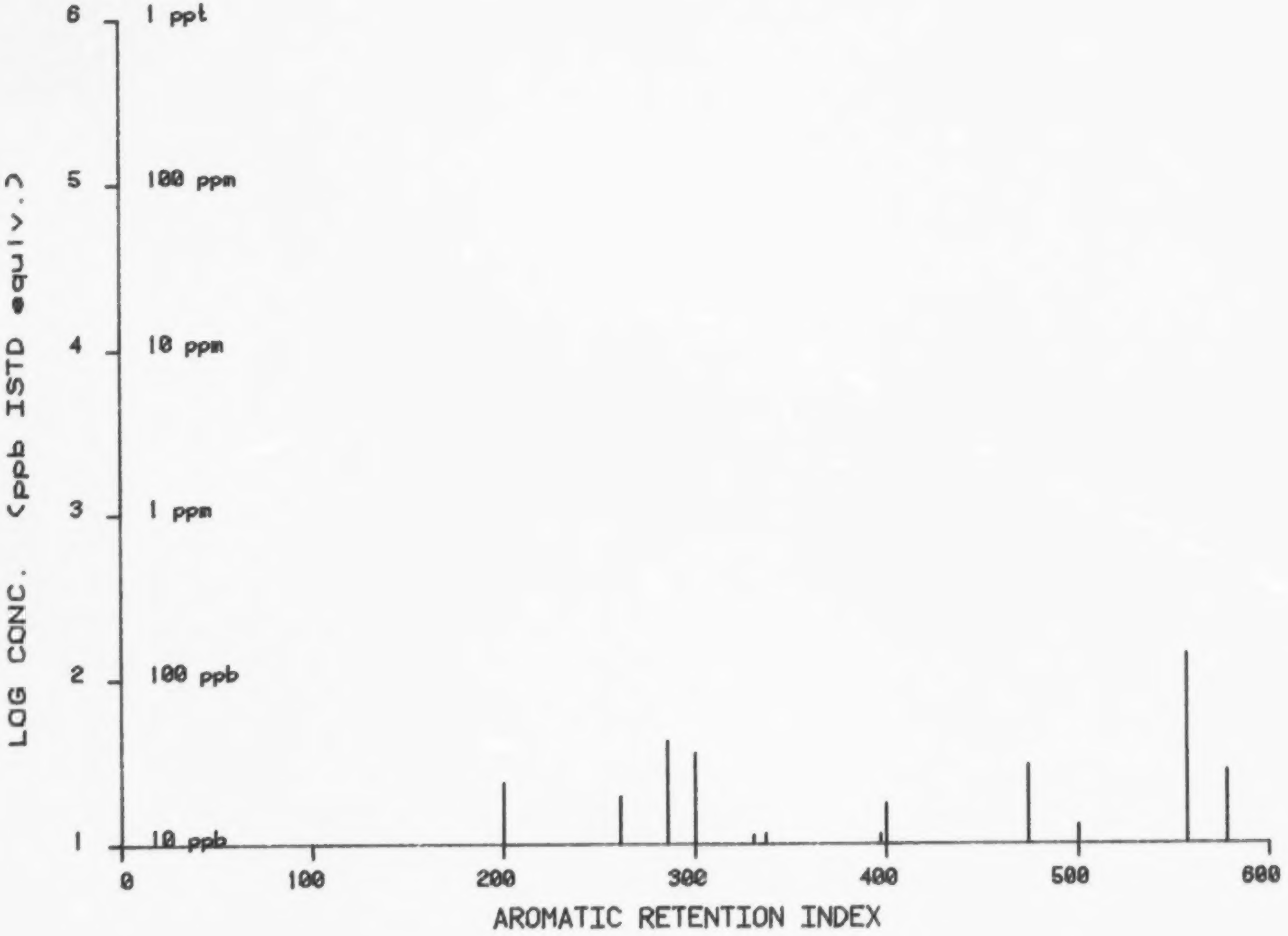
SEDIMENT, FID, STATION 09, SPRING 1979



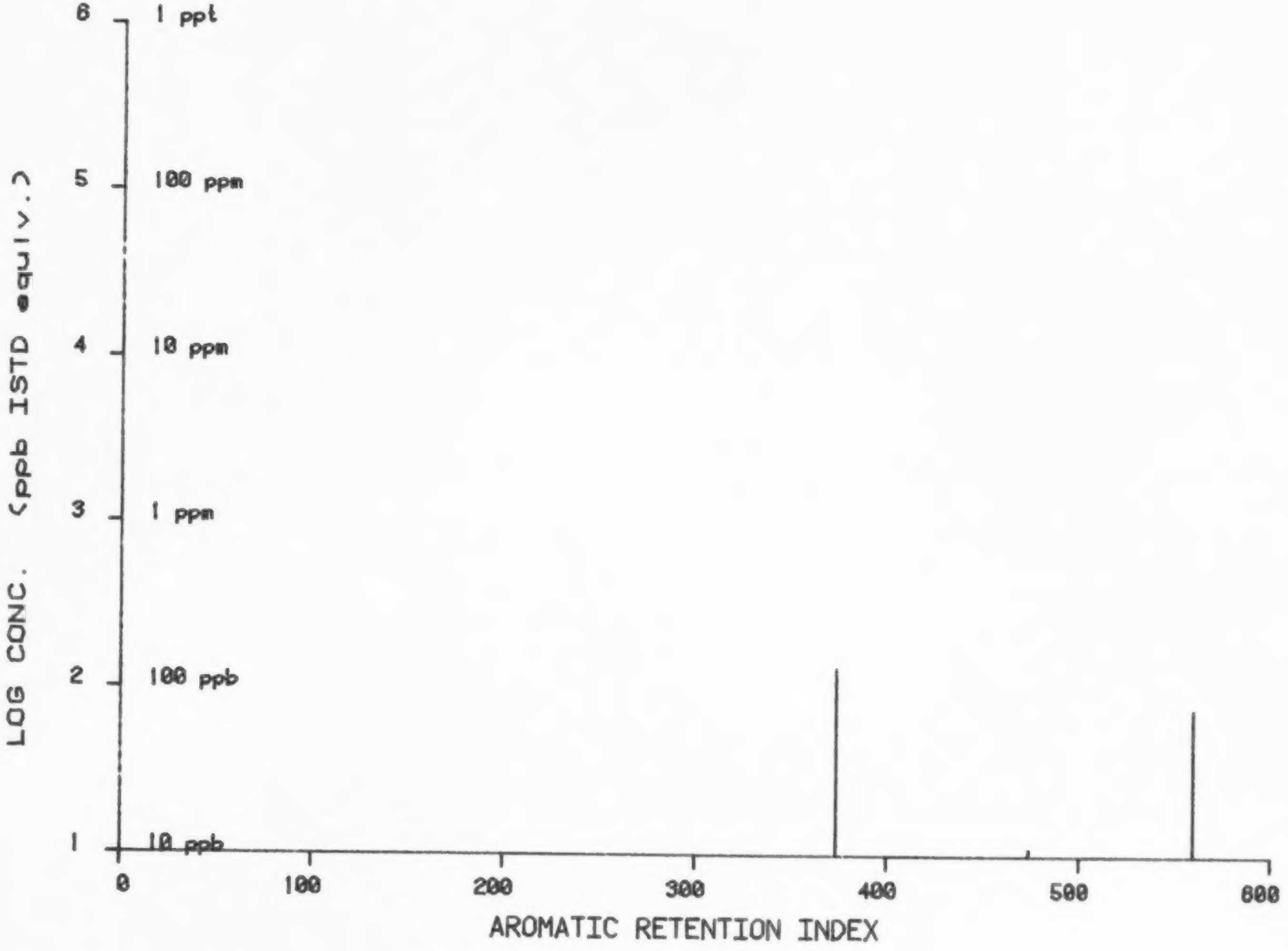
SEDIMENT, FID, STATION 11, SPRING 1979



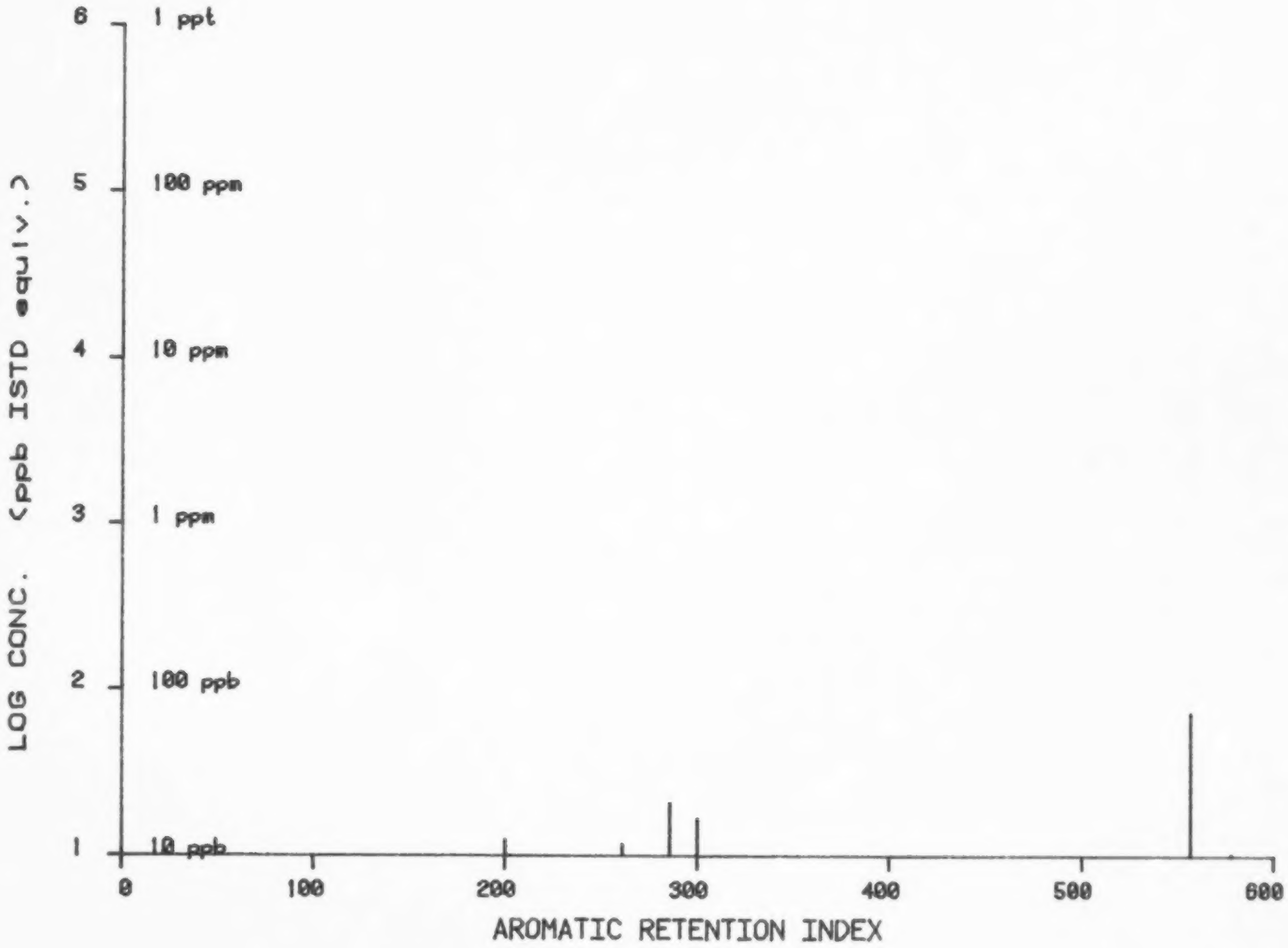
SEDIMENT, FID, STATION 12, SPRING 1979



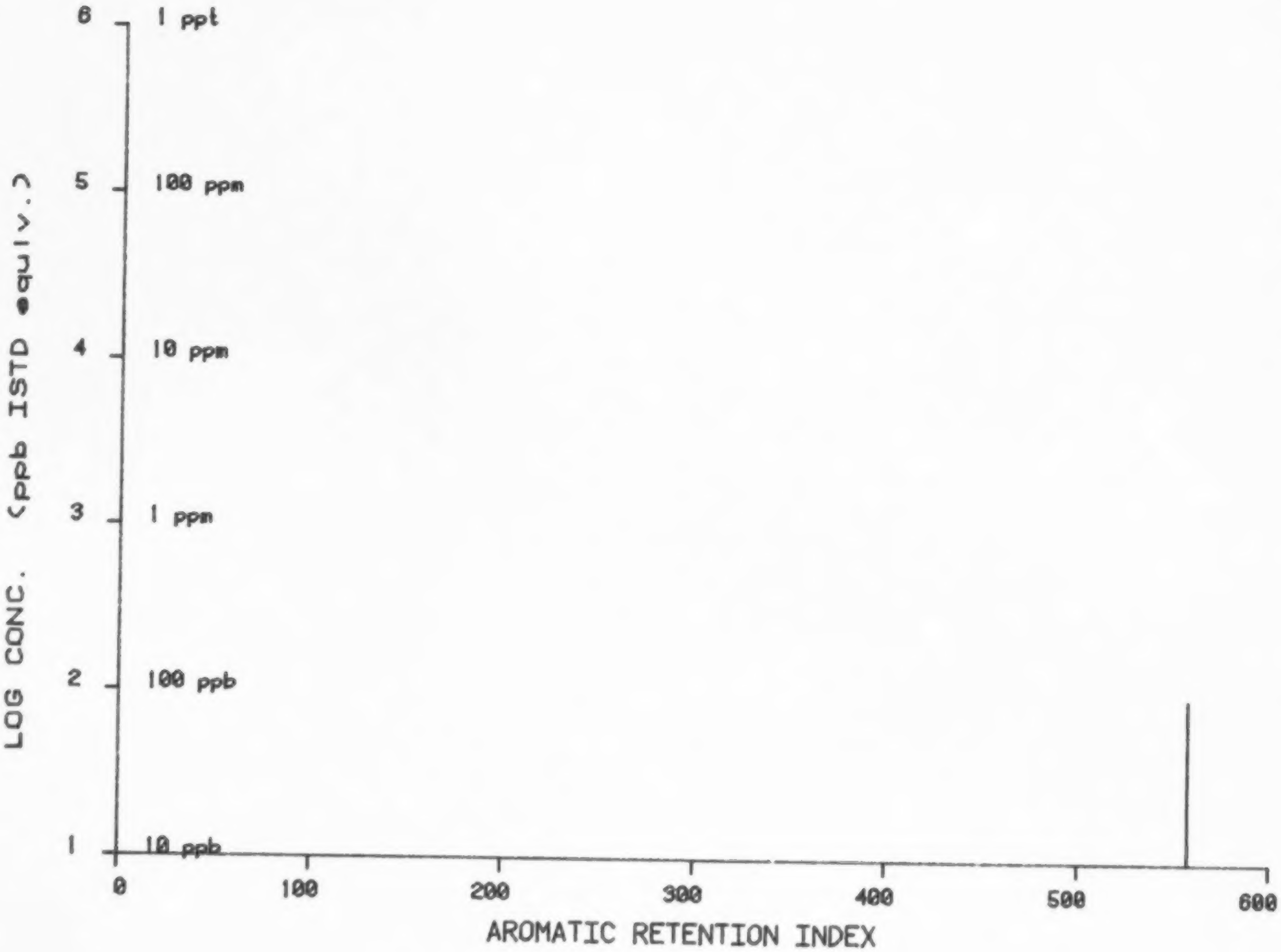
SEDIMENT, FID, STATION 13, SPRING 1979



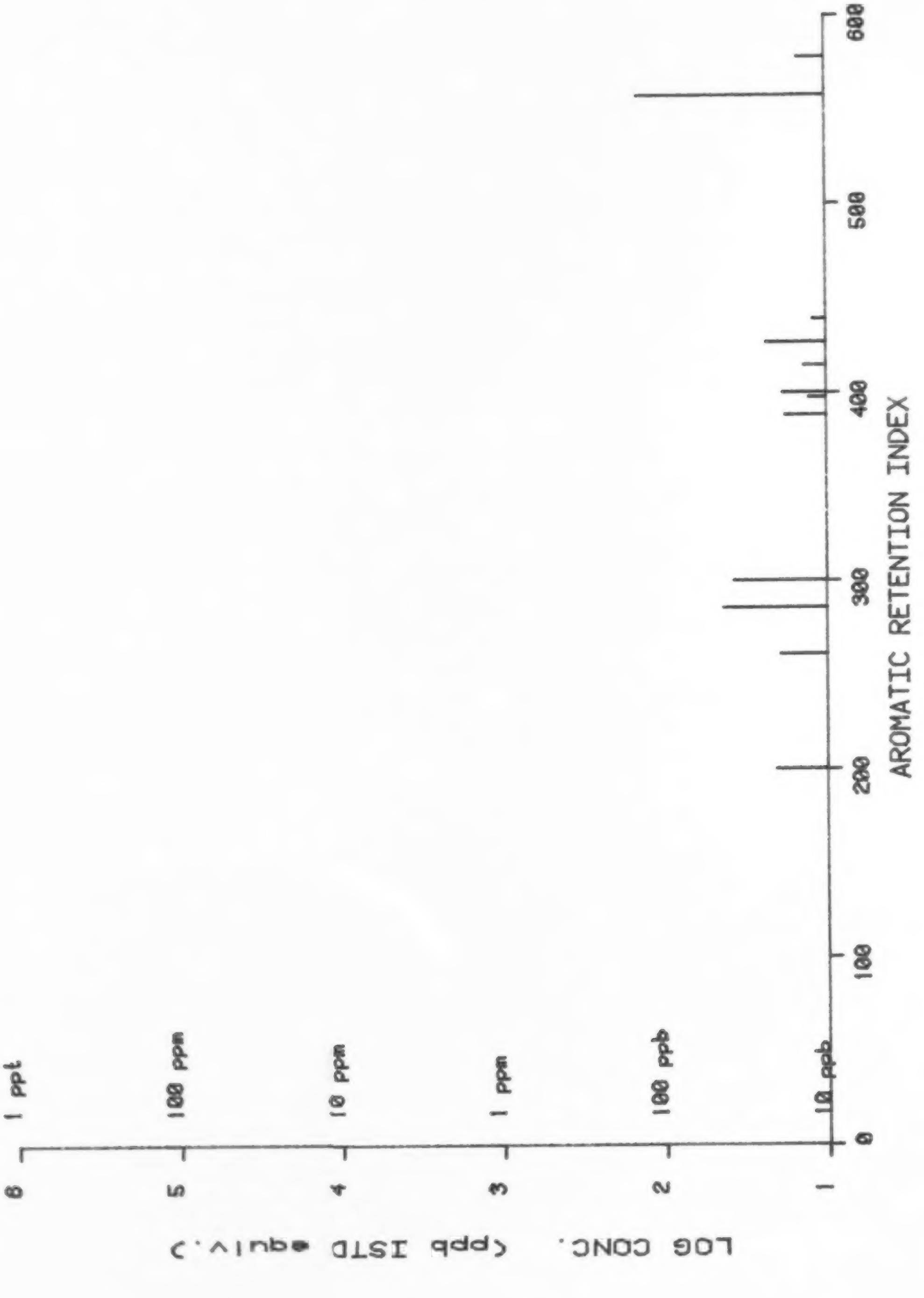
SEDIMENT, FID, STATION 14, SPRING 1979



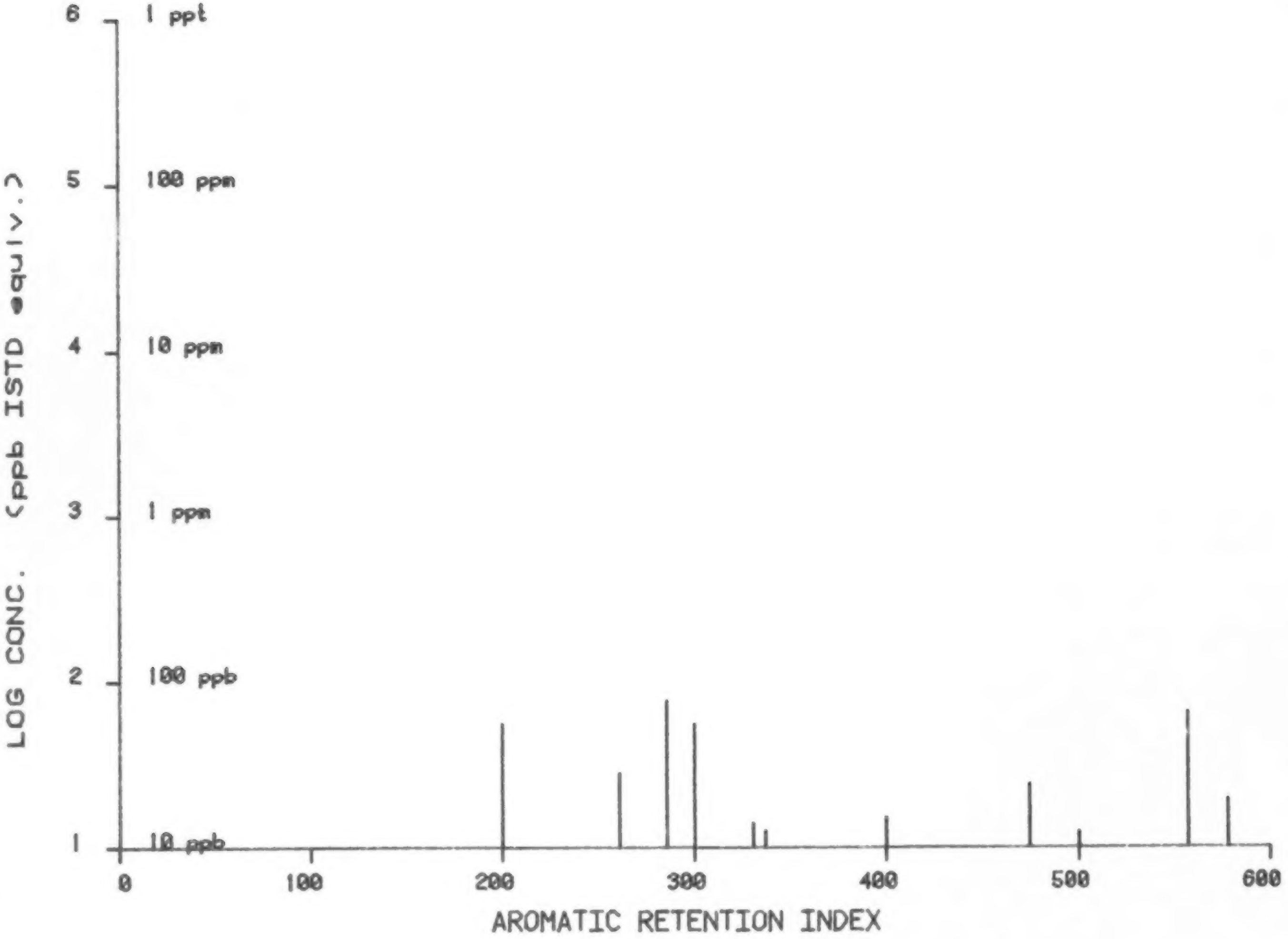
SEDIMENT, FID, STATION 15, SPRING 1979



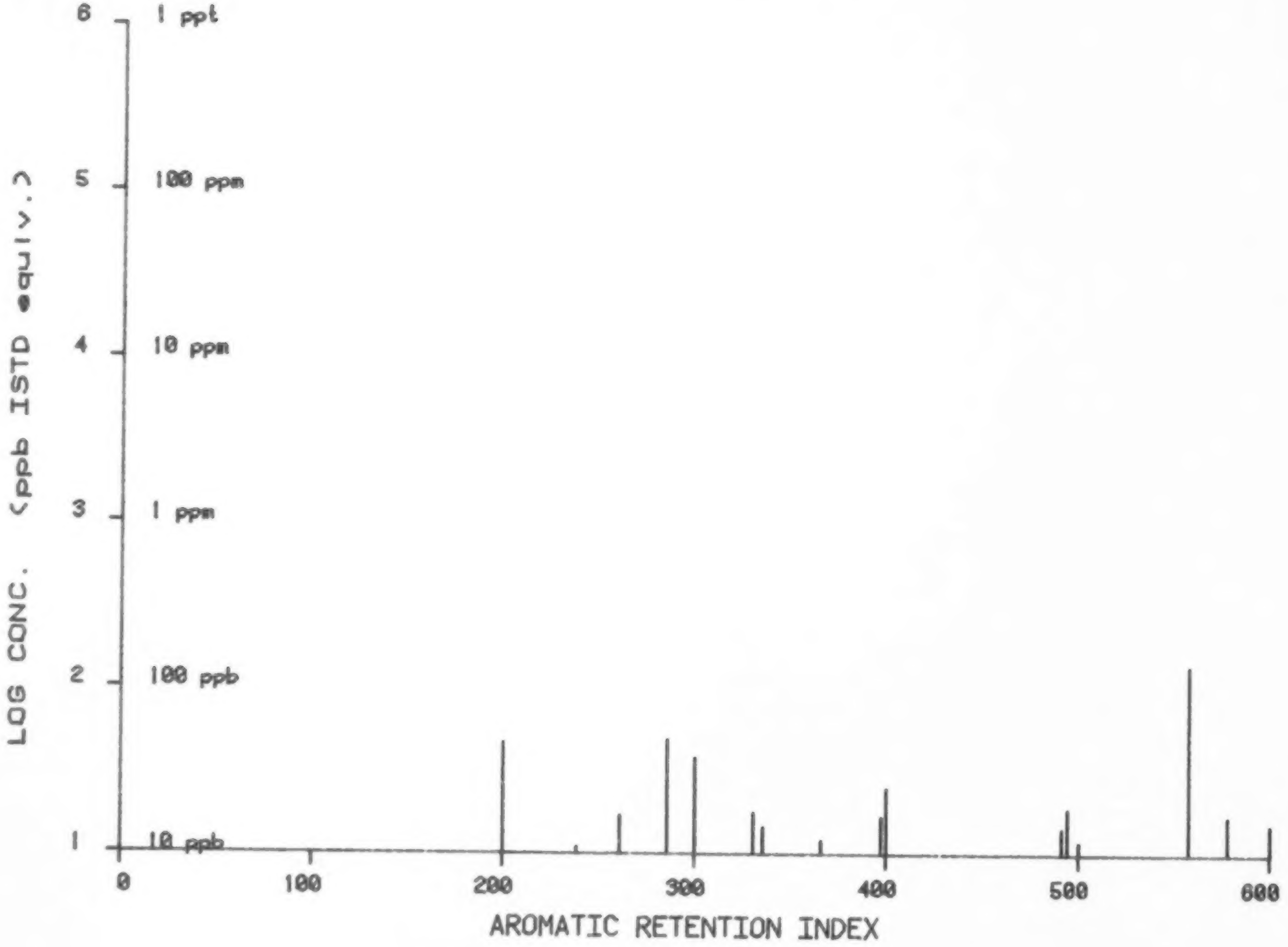
SEDIMENT, FID, STATION 16, SPRING 1979



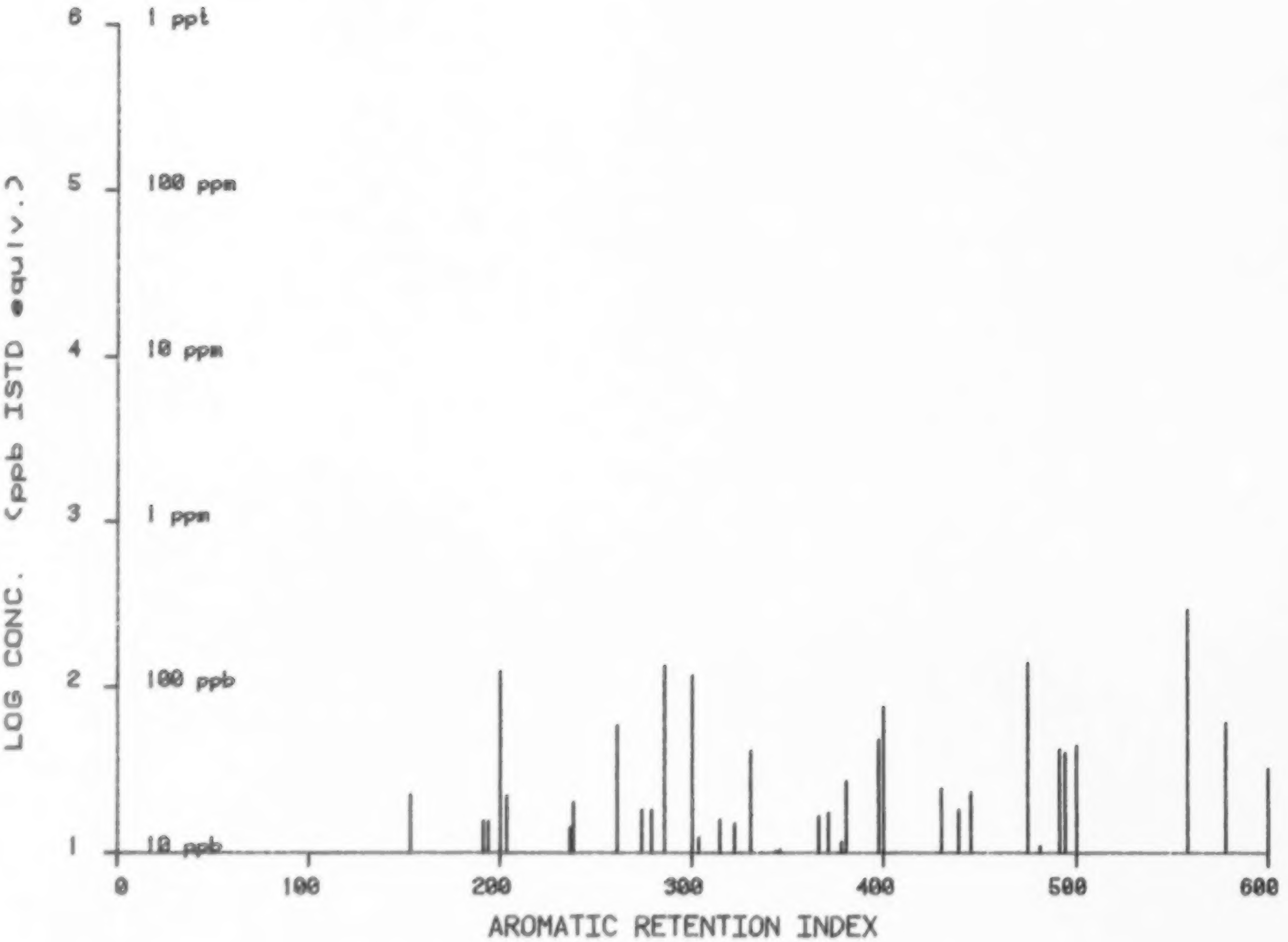
SEDIMENT, FID, STATION 17, SPRING 1979



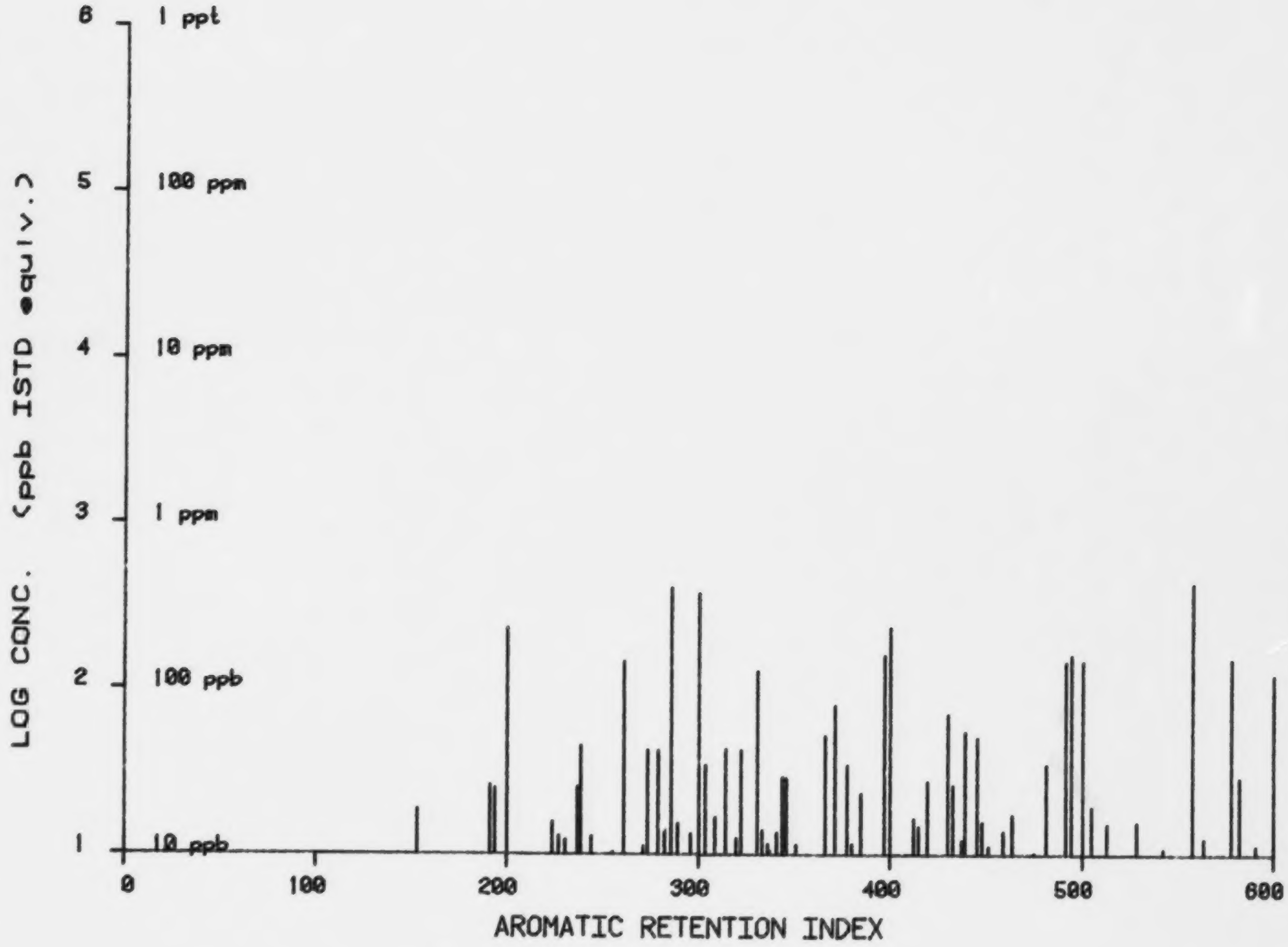
SEDIMENT, FID, STATION 18, SPRING 1979



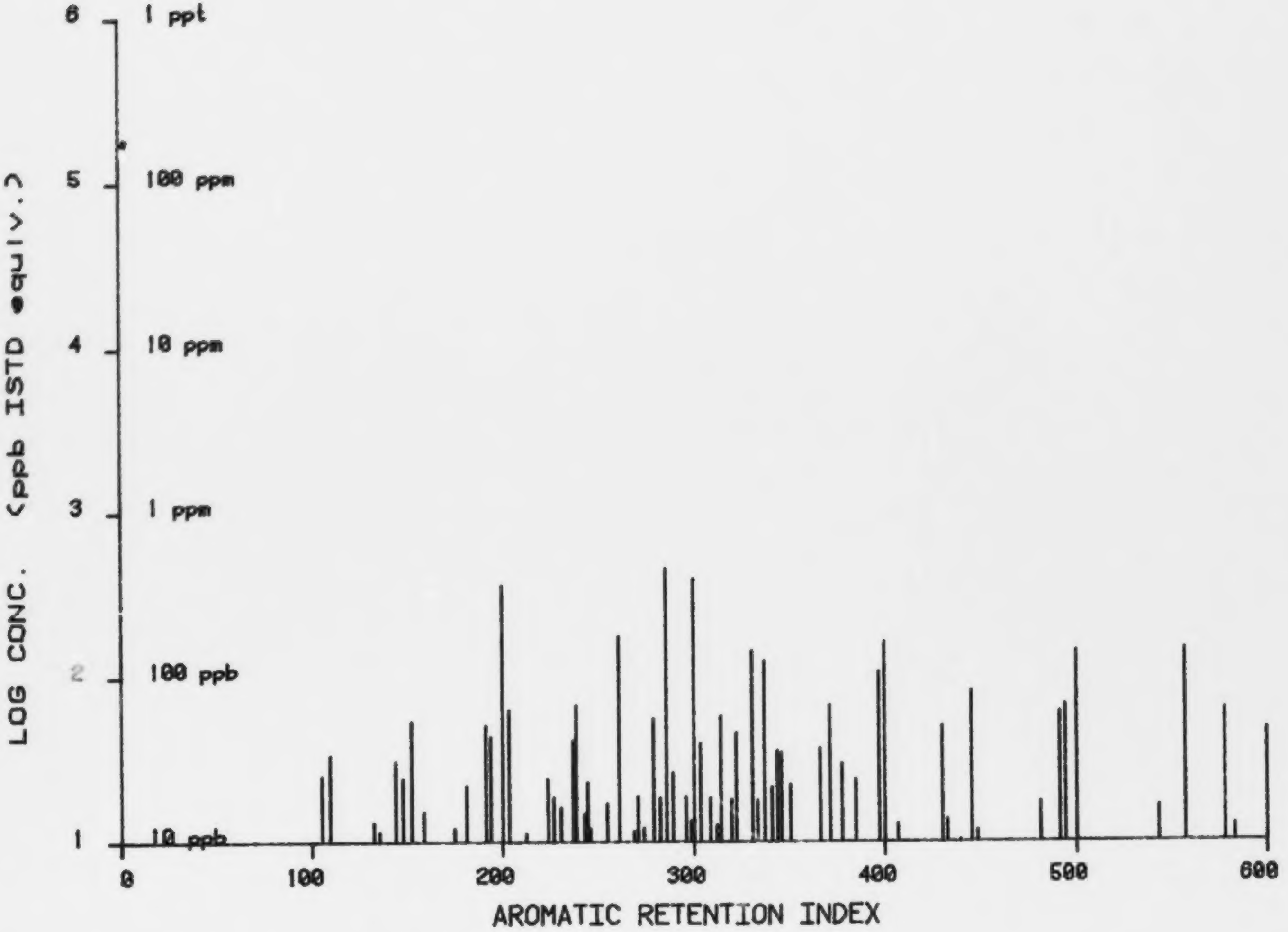
SEDIMENT, FID, STATION 19, SPRING 1979



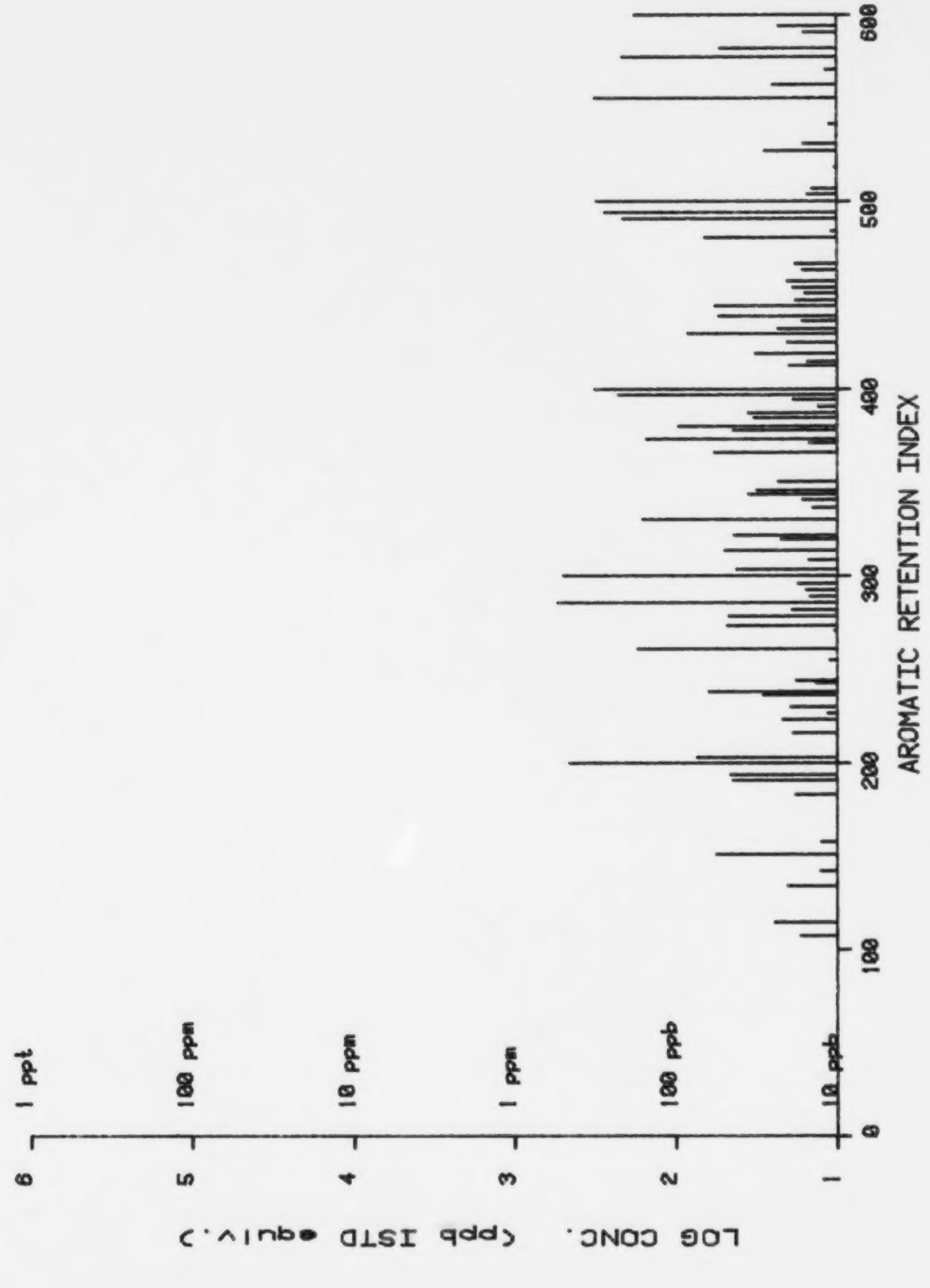
SEDIMENT, FID, STATION 20, SPRING 1979



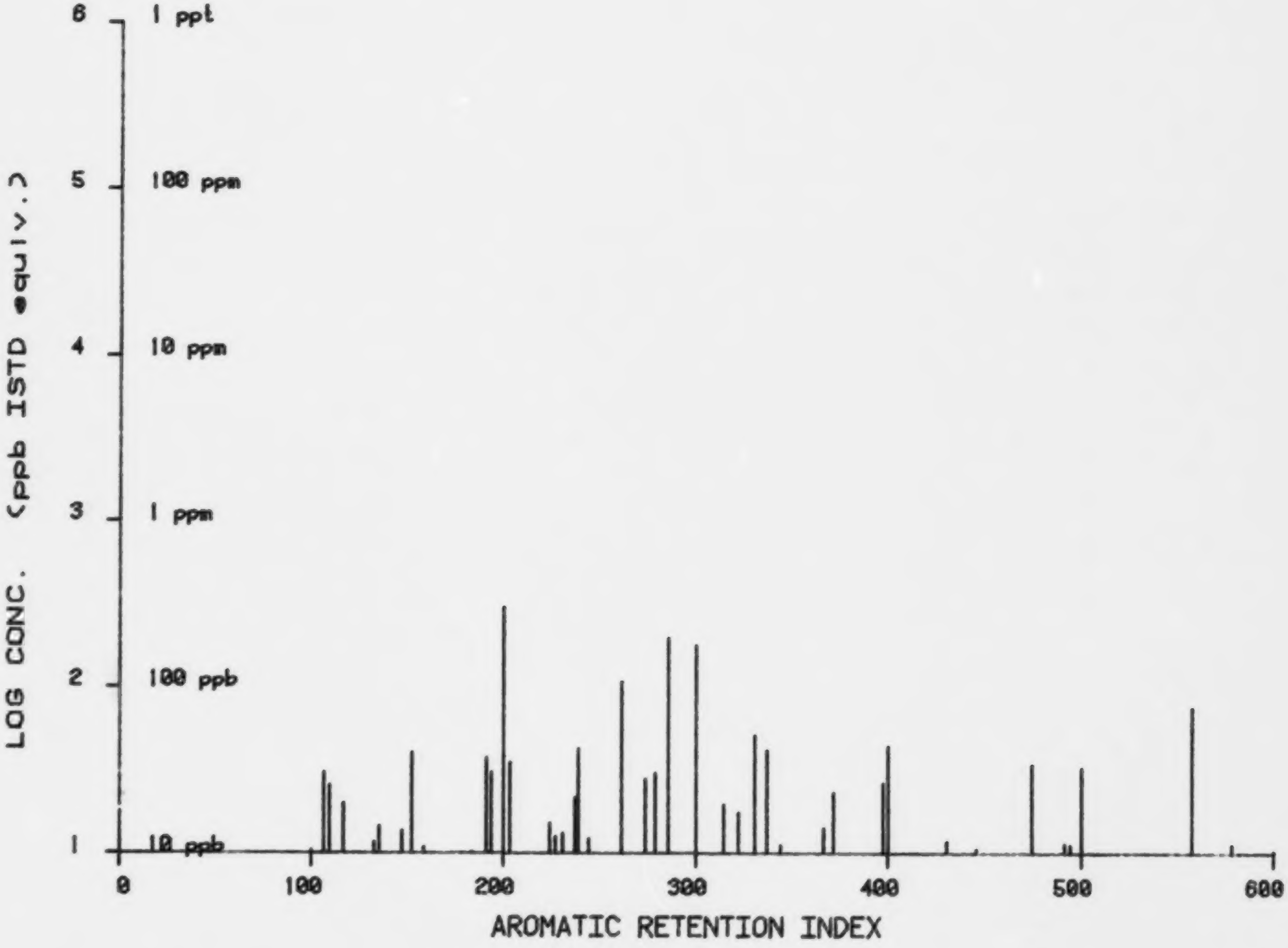
SEDIMENT, FID, STATION 21, SPRING 1979



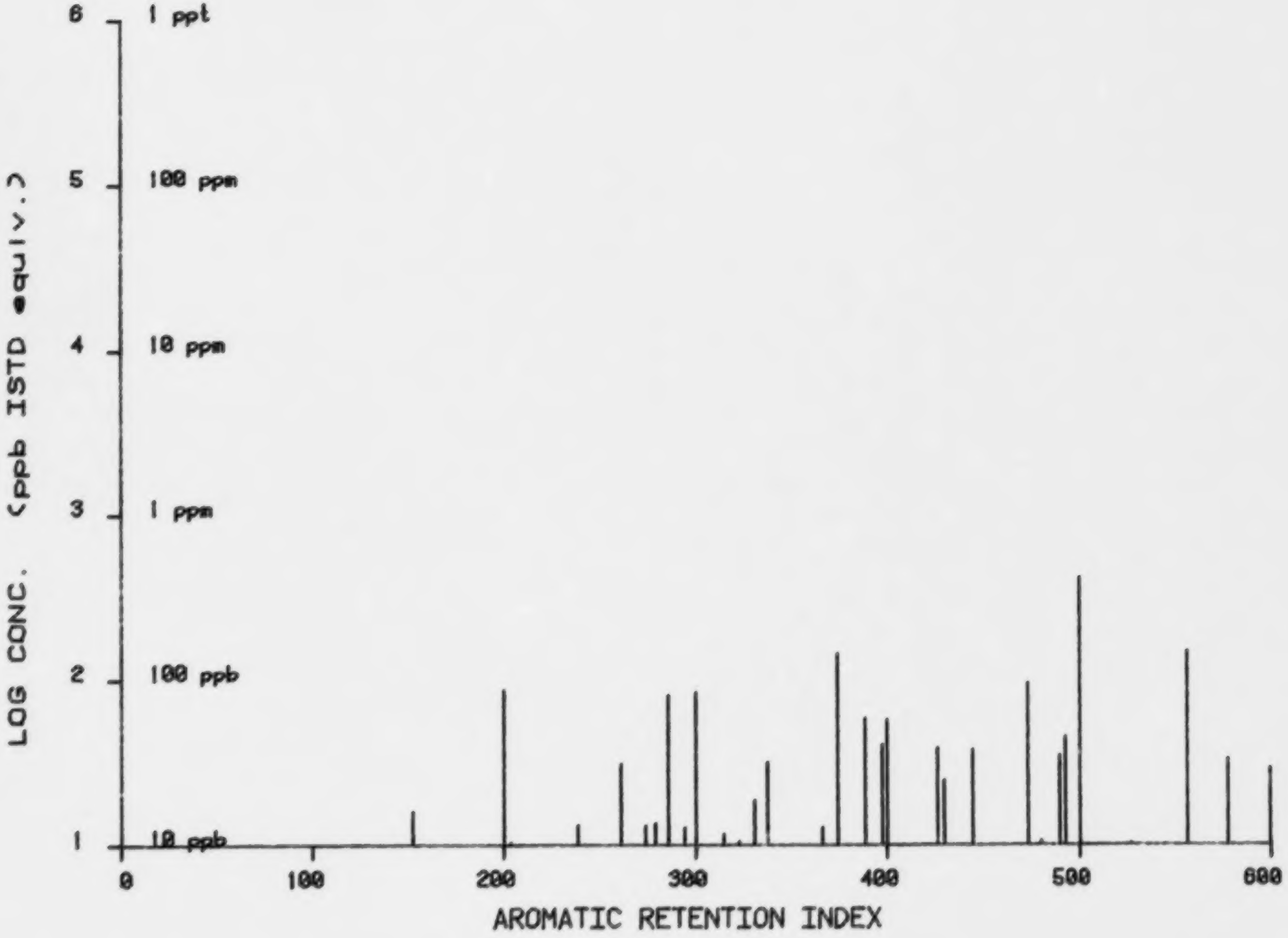
SEDIMENT, FID, STATION 22, SPRING 1979



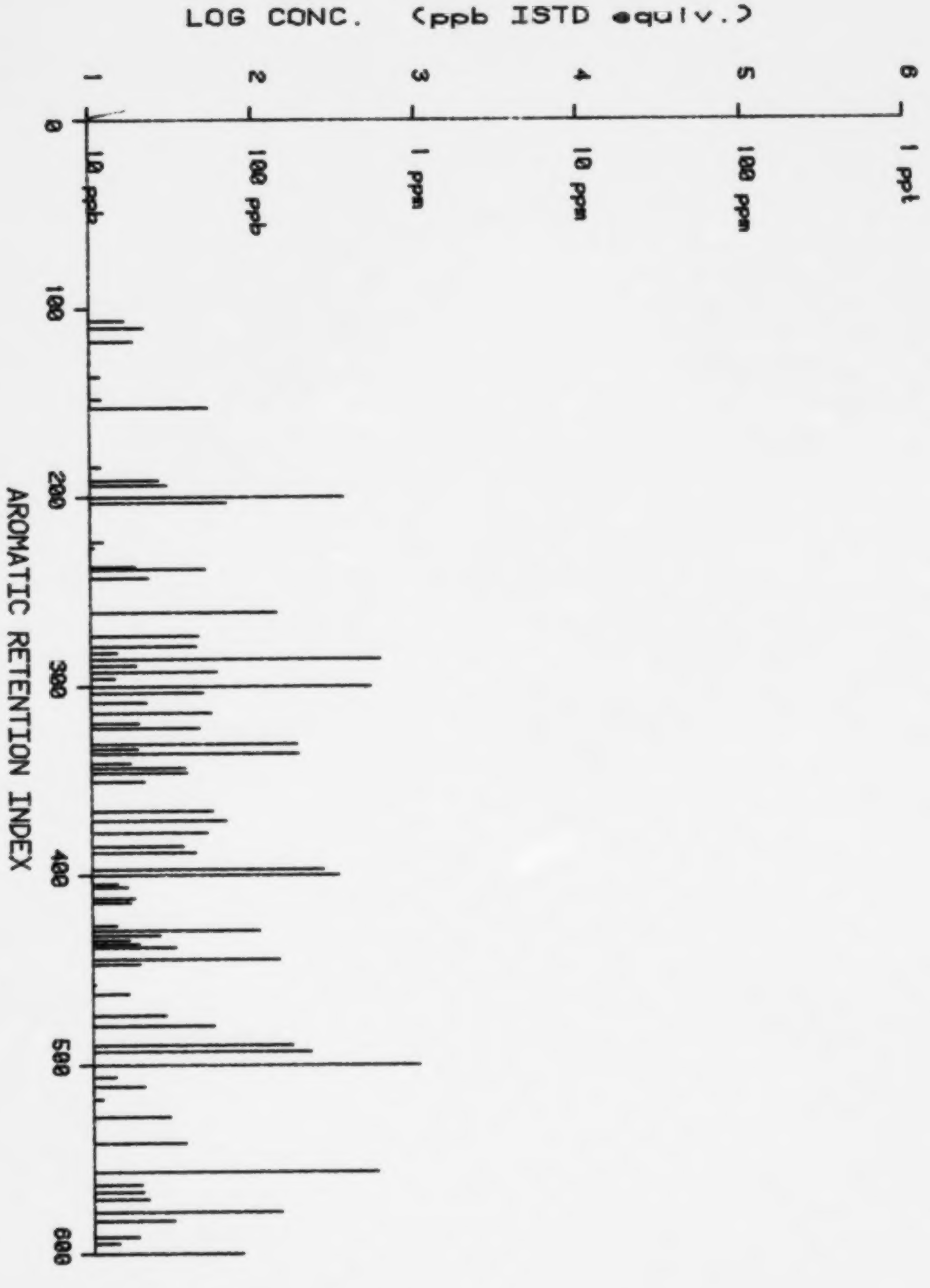
SEDIMENT, FID, STATION 23, SPRING 1979



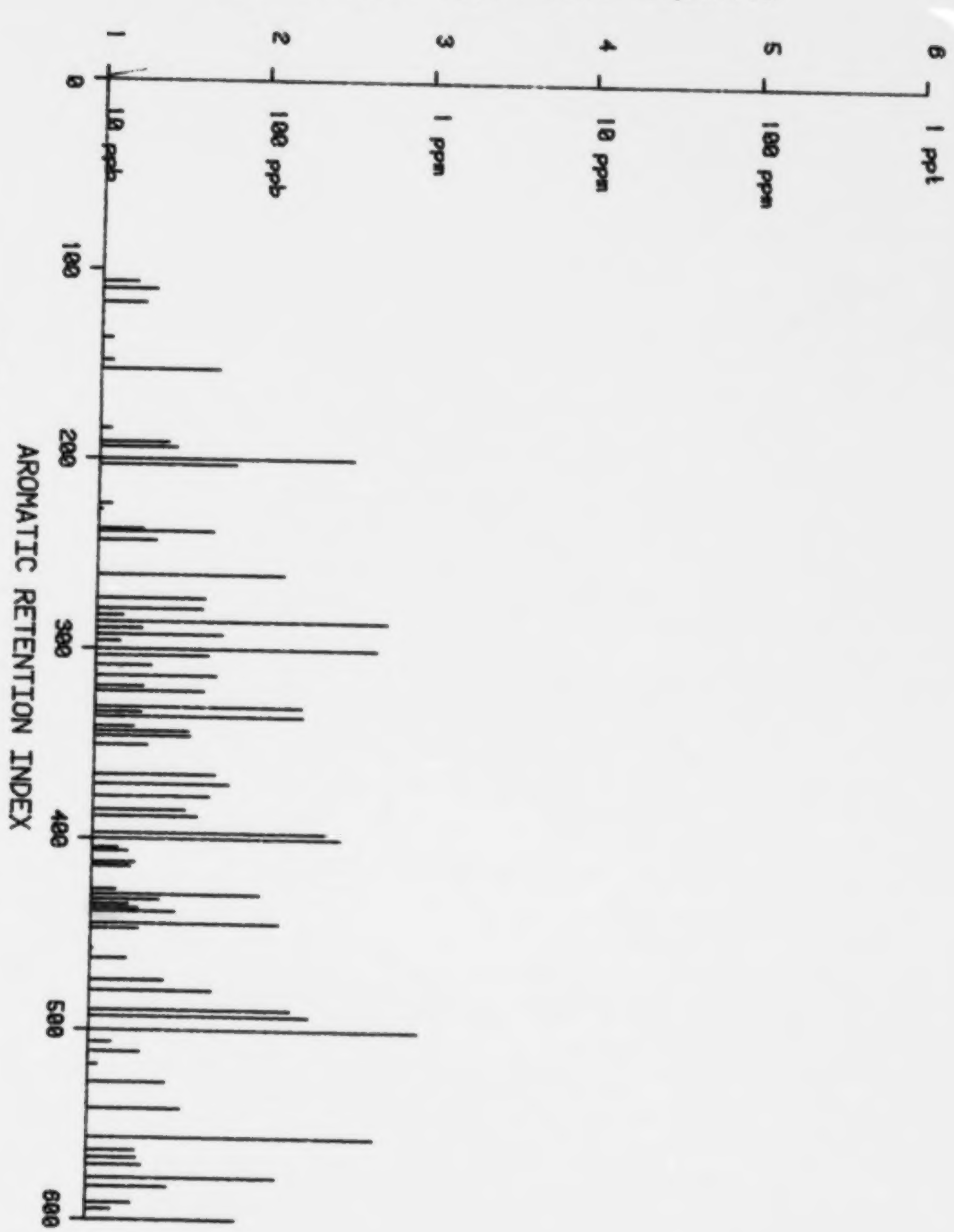
SEDIMENT, FID, STATION 24, SPRING 1979



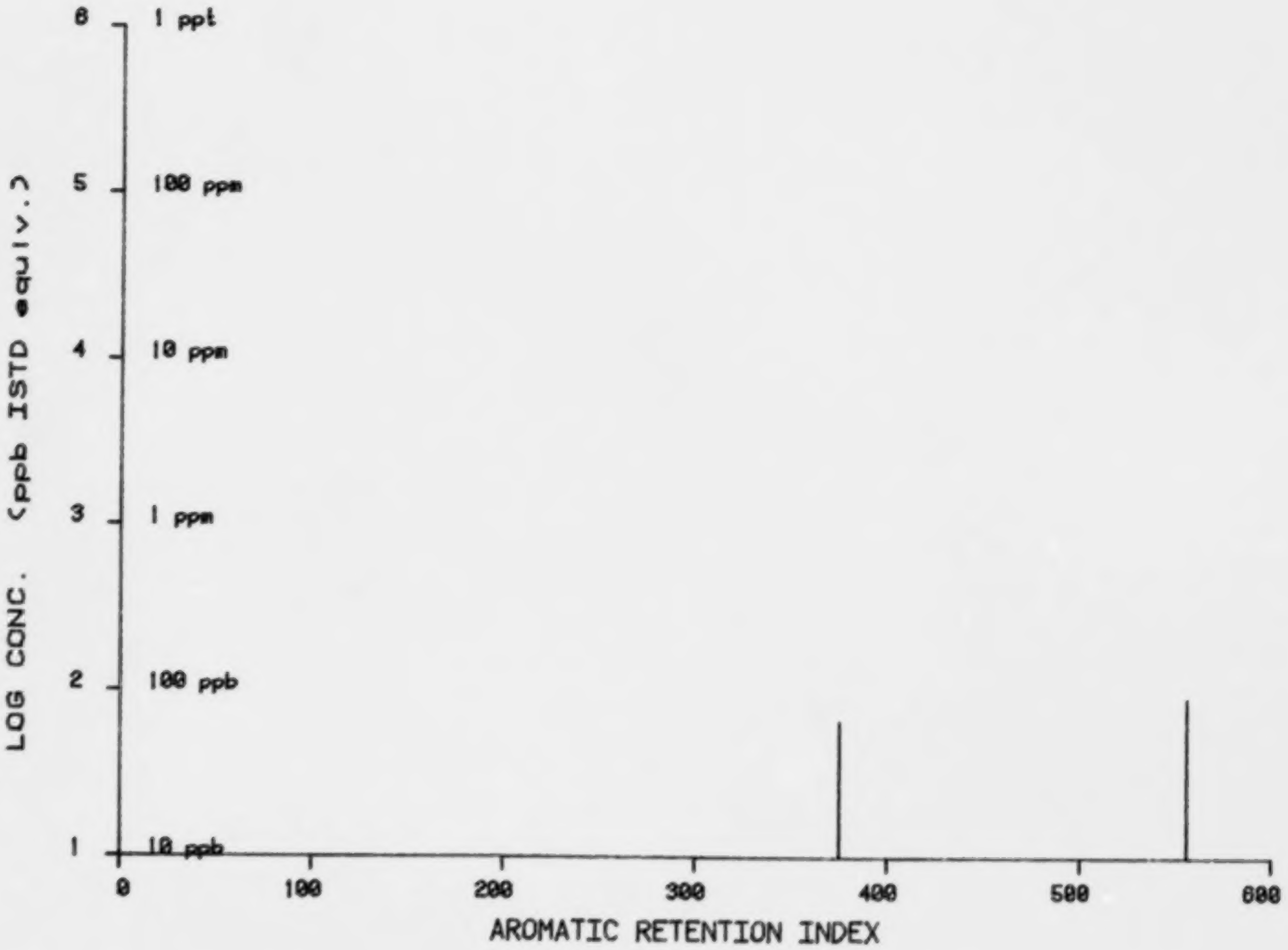
SEDIMENT, FID, STATION 25, SPRING 1979



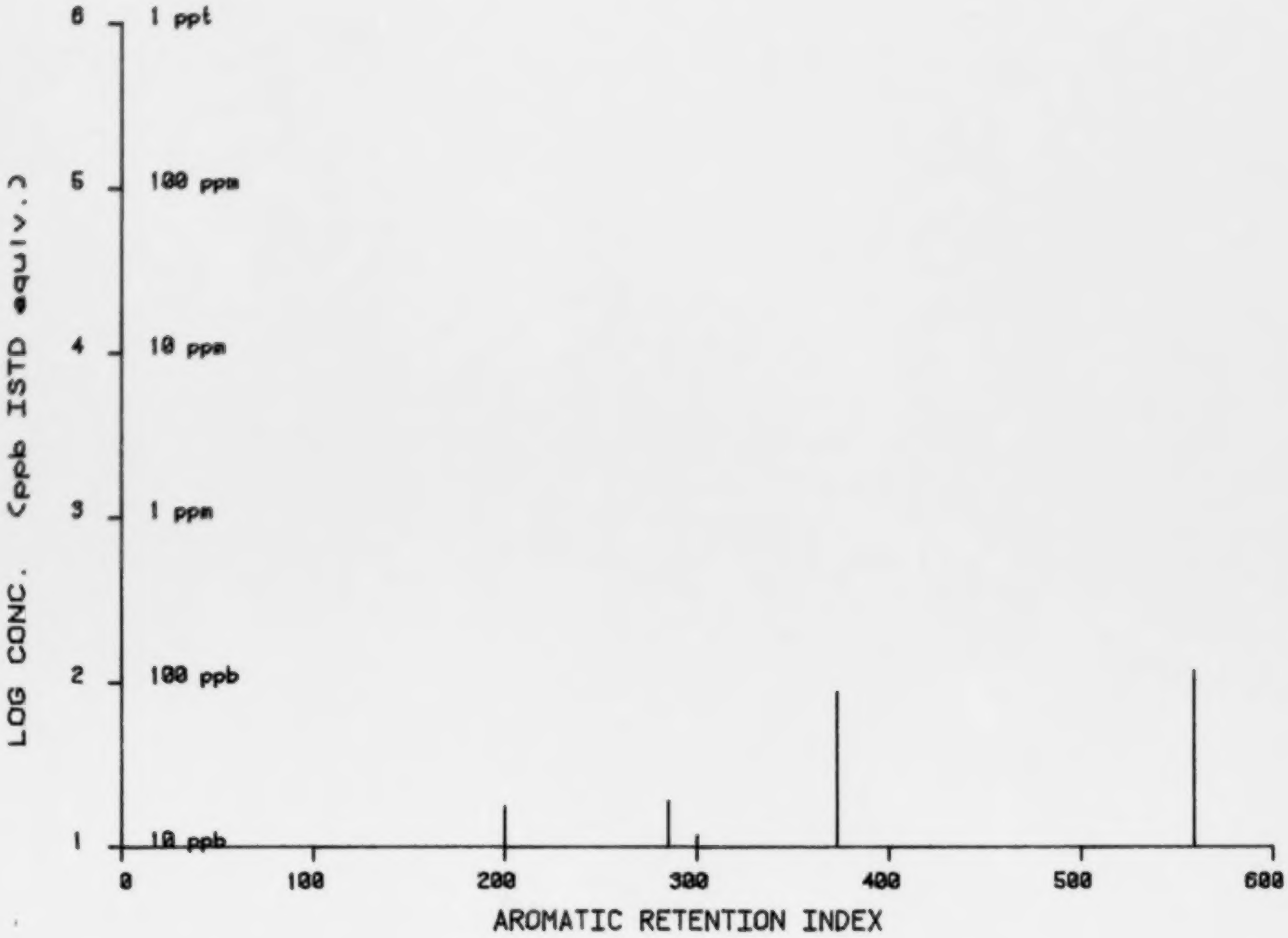
SEDIMENT, FID, STATION 26, SPRING 1979



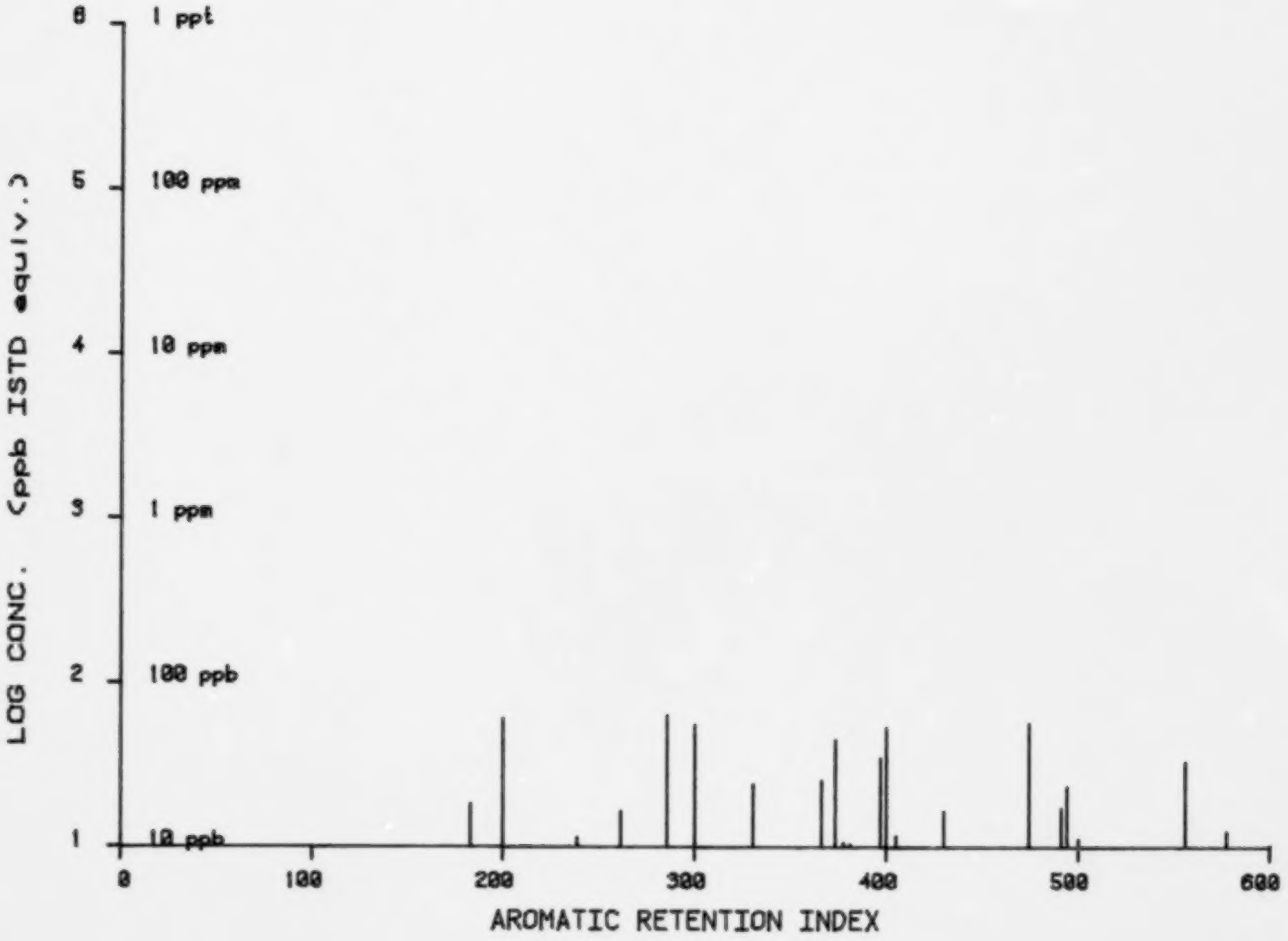
SEDIMENT, FID, STATION 26, SPRING 1979



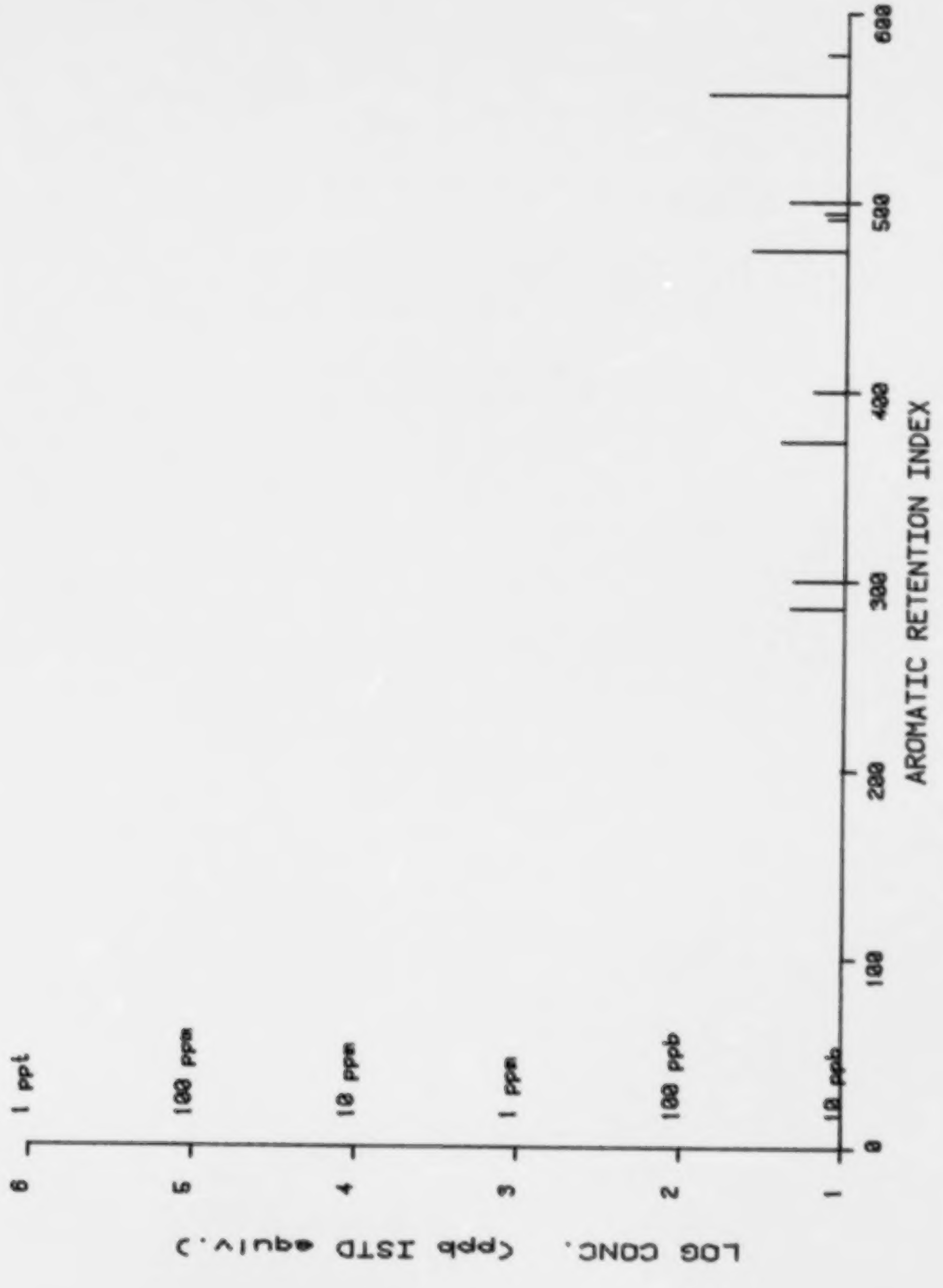
SEDIMENT, FID, STATION 27, SPRING 1979



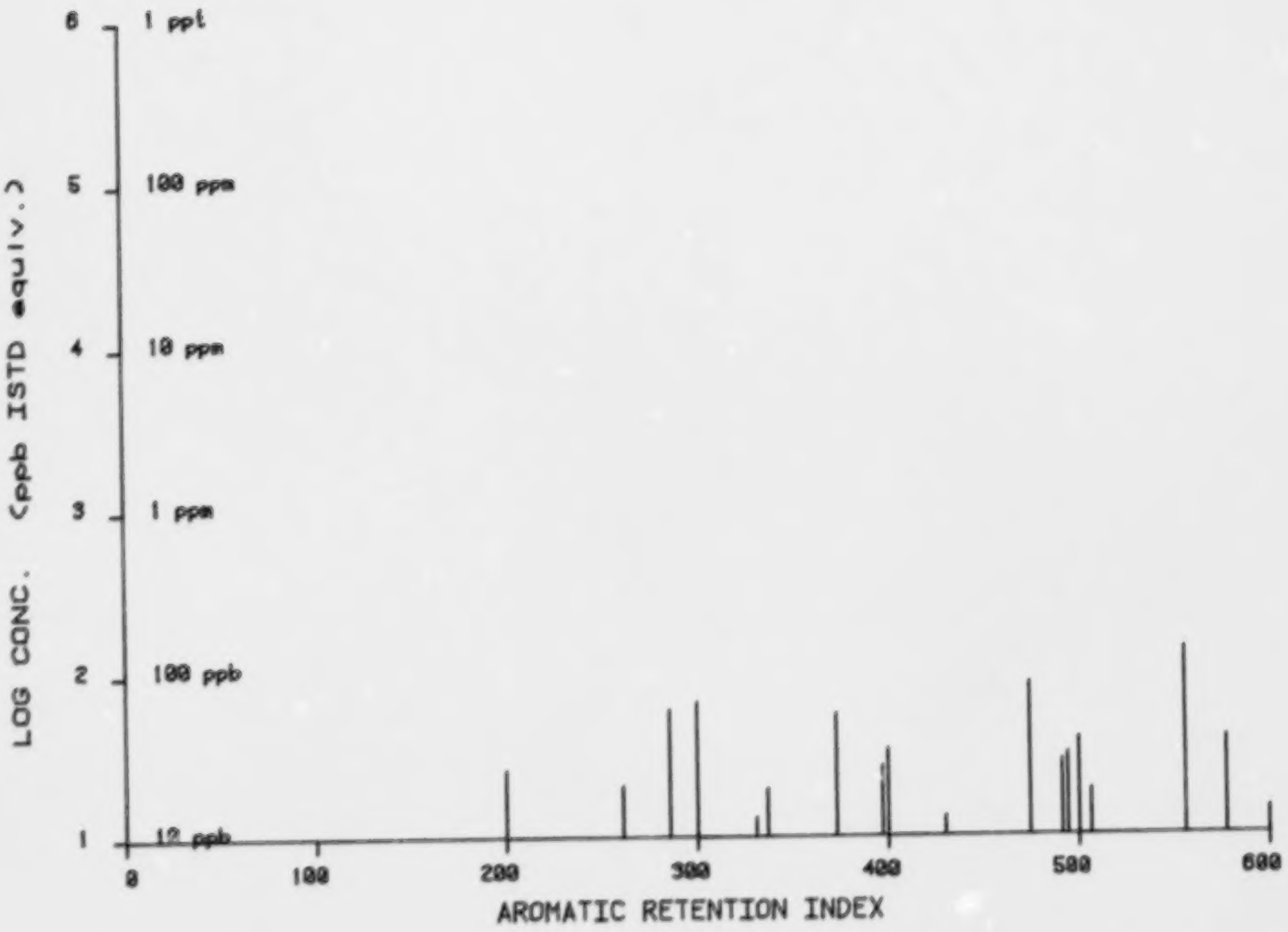
SEDIMENT, FID, STATION 01, FALL 1979



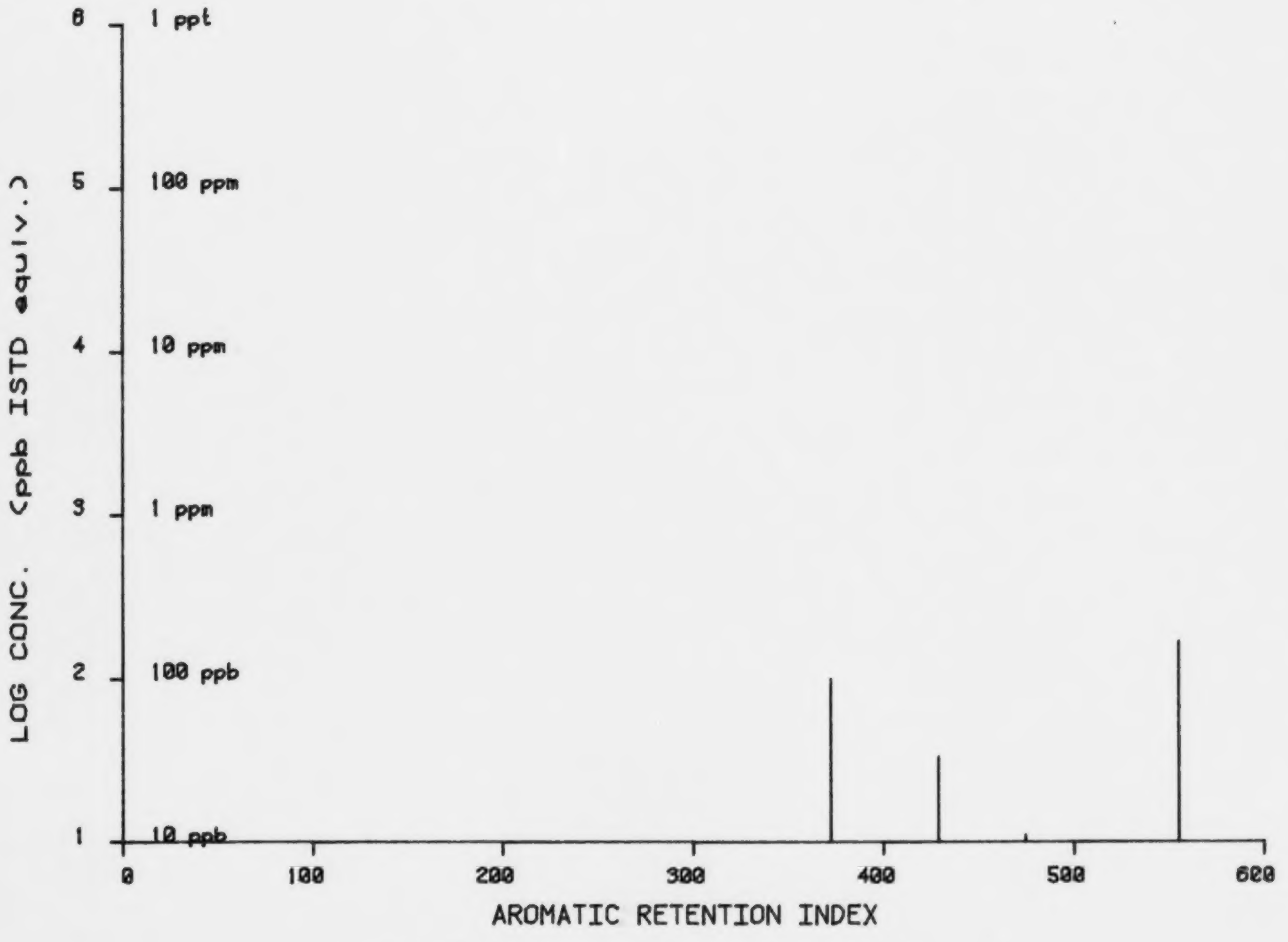
SEDIMENT, FID, STATION 03, FALL 1979



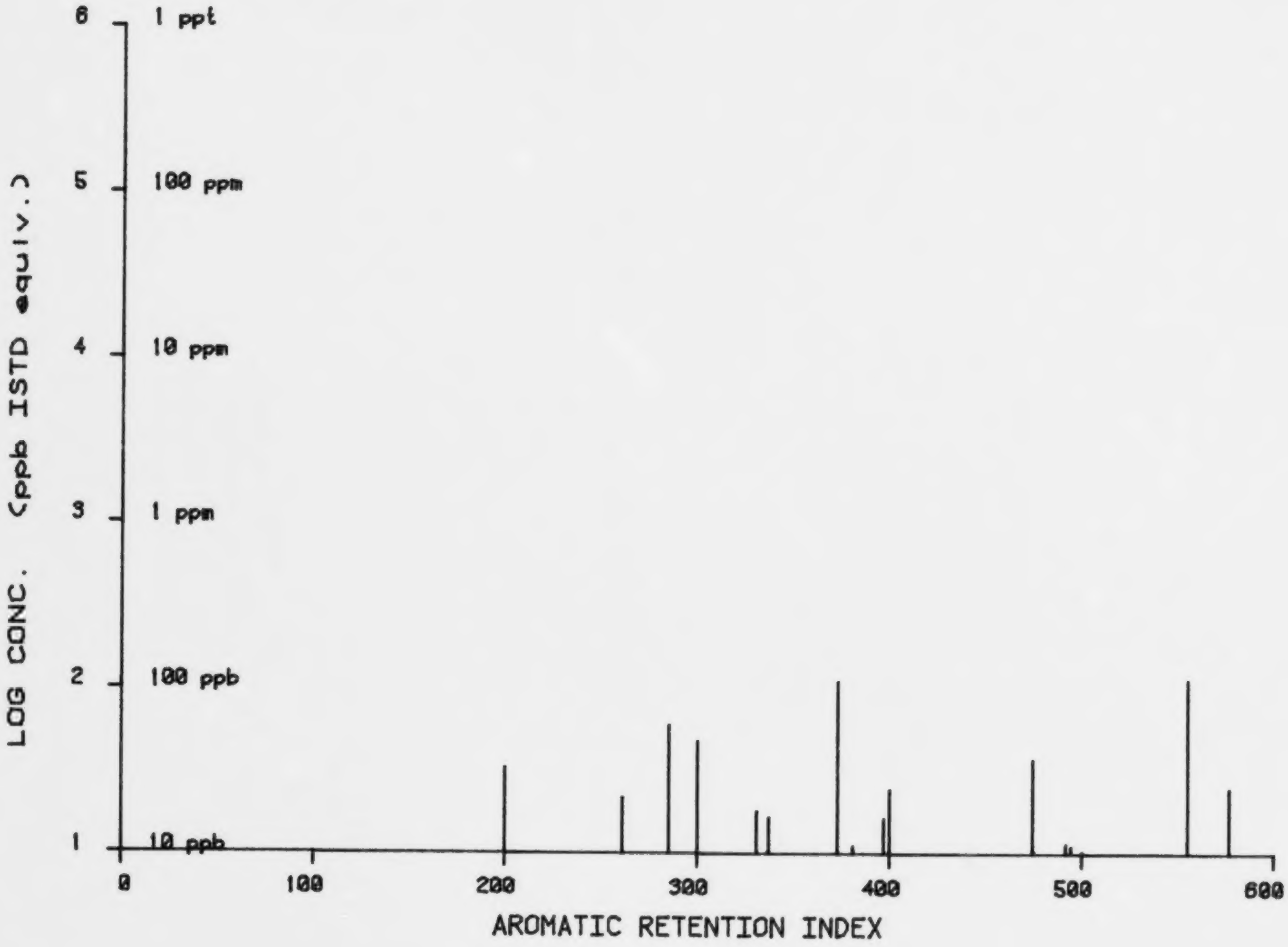
SEDIMENT, FID, STATION 05, FALL 1979



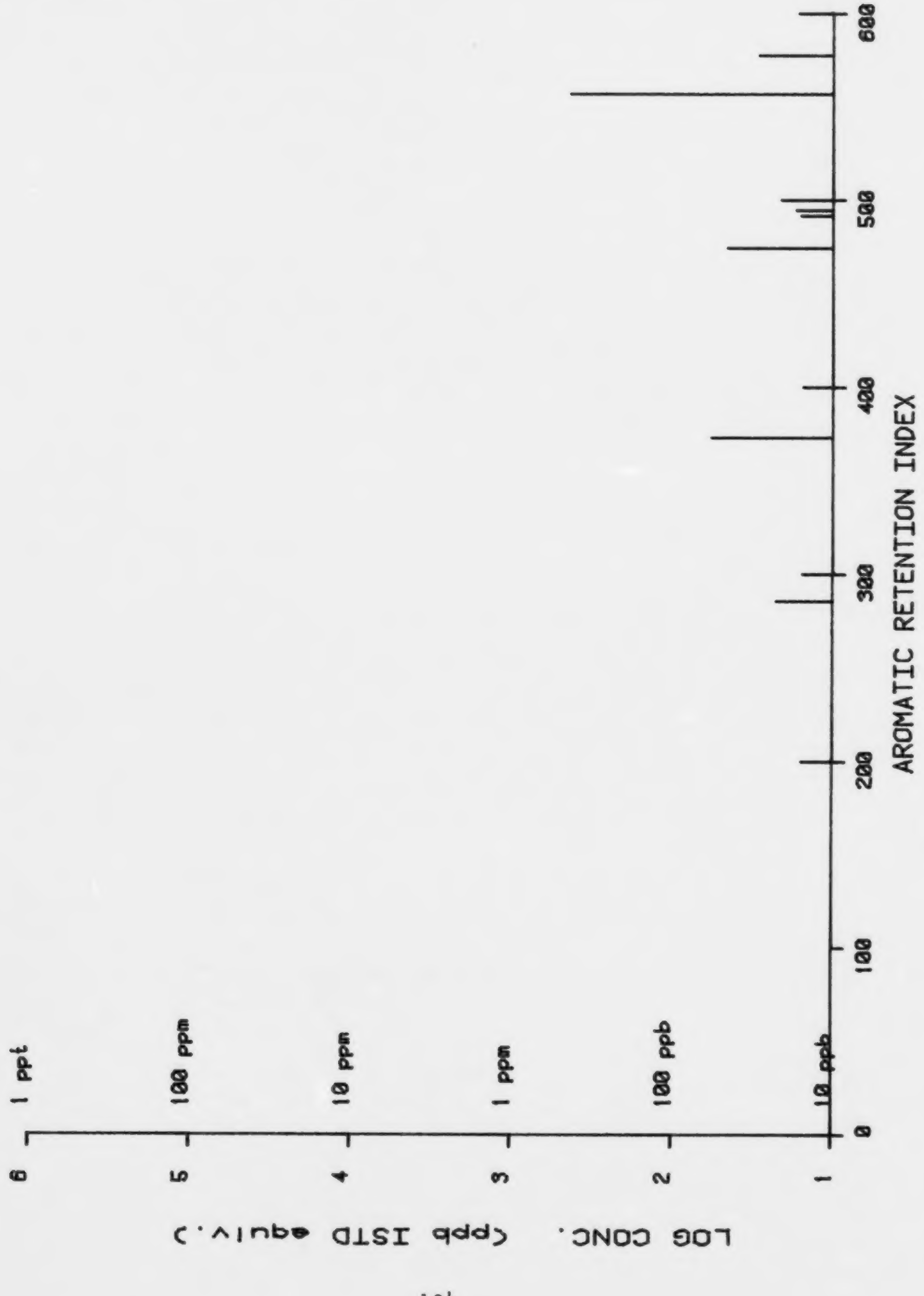
SEDIMENT, FID, STATION 08, FALL 1979



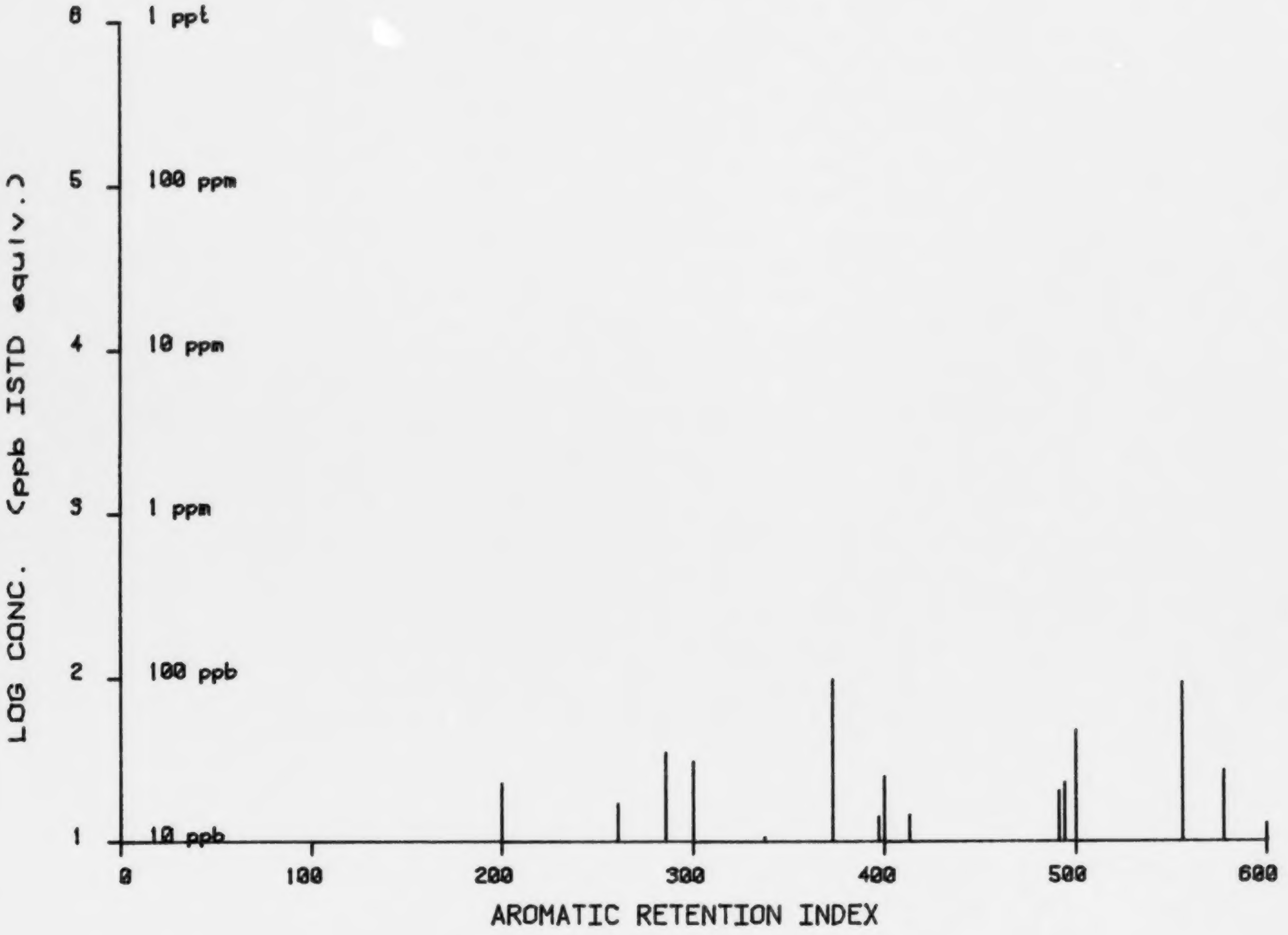
SEDIMENT, FID, STATION 09, FALL 1979



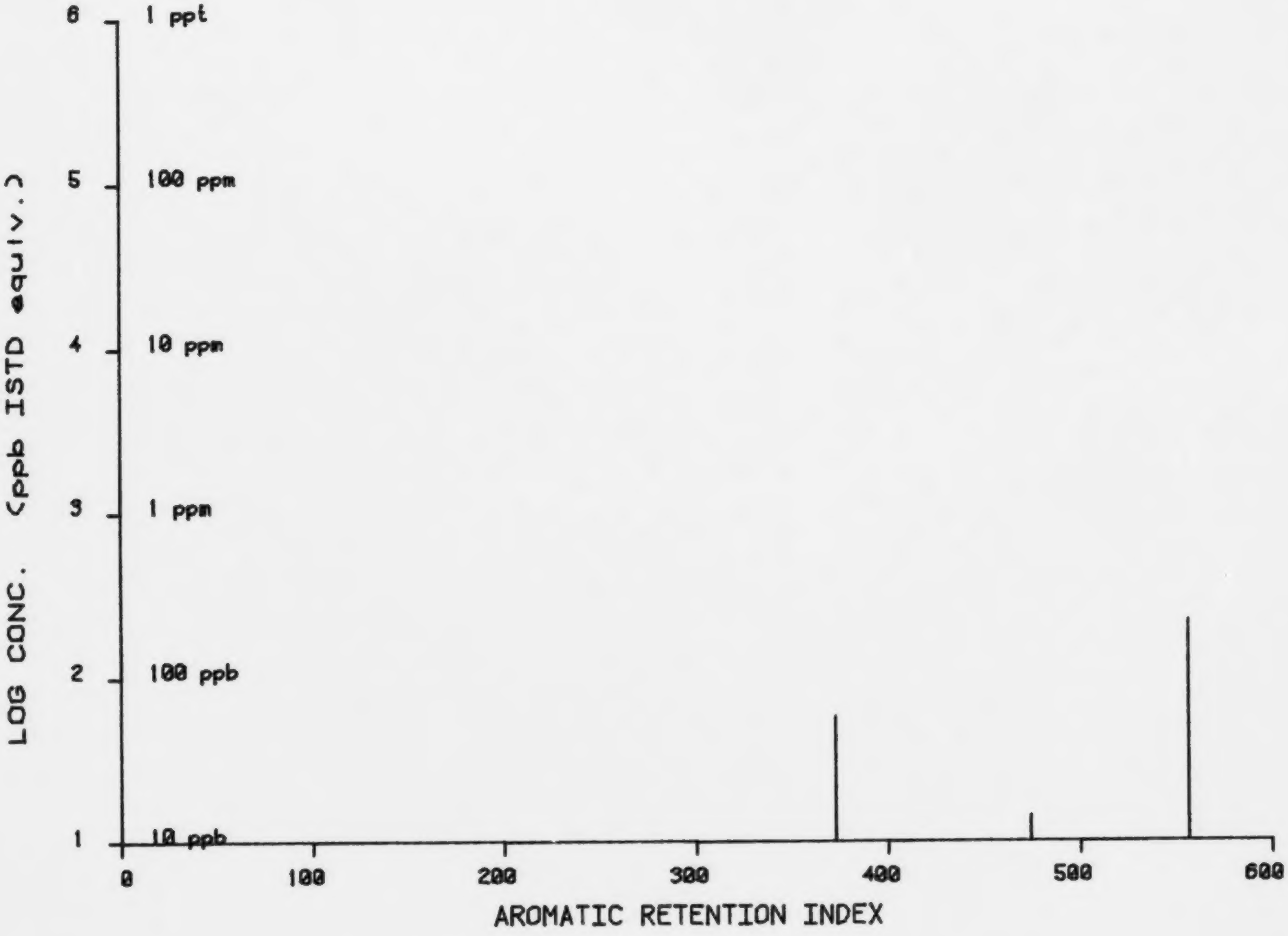
SEDIMENT, FID, STATION 13, FALL 1979



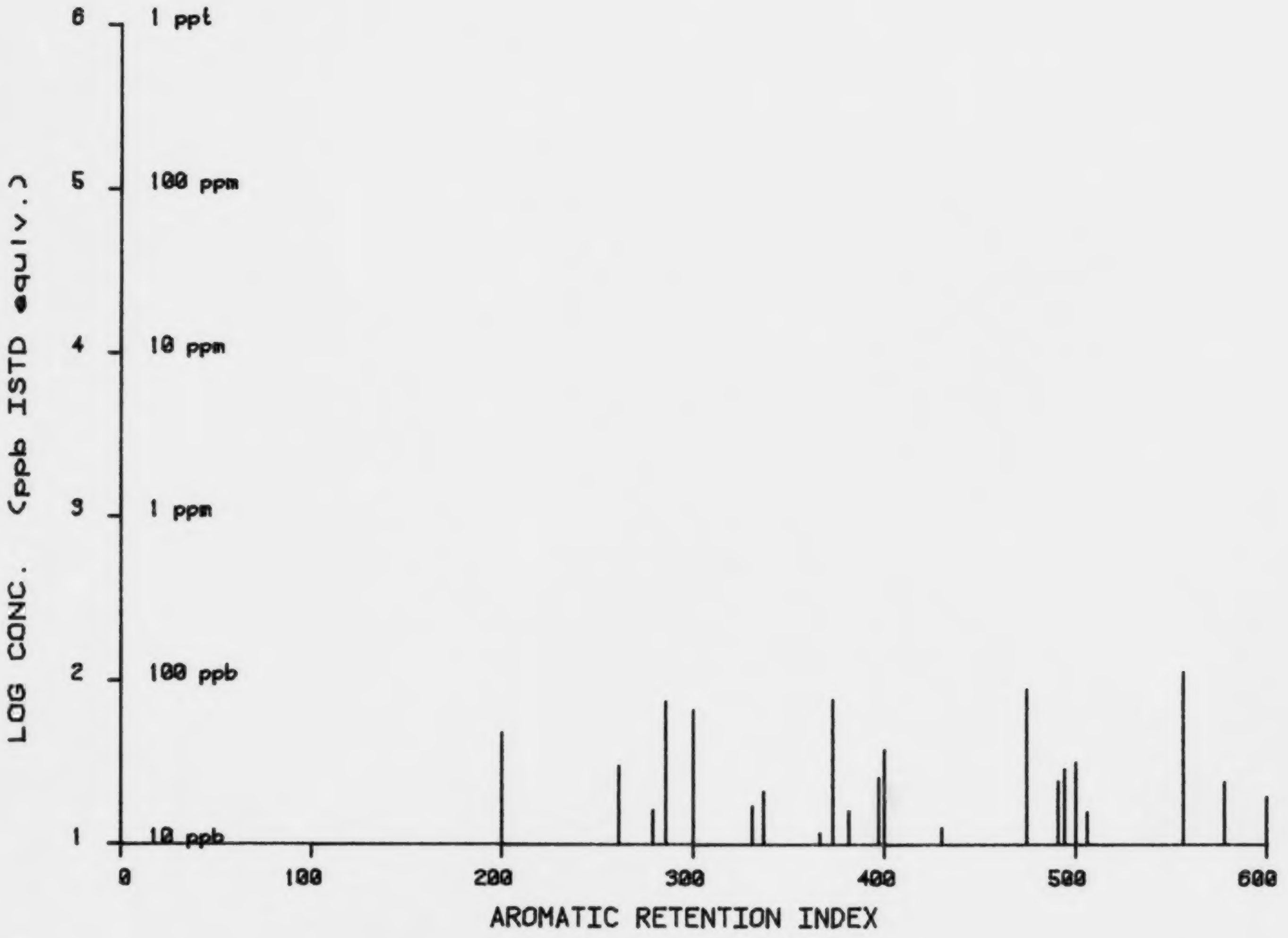
SEDIMENT, FID, STATION 14, FALL 1979



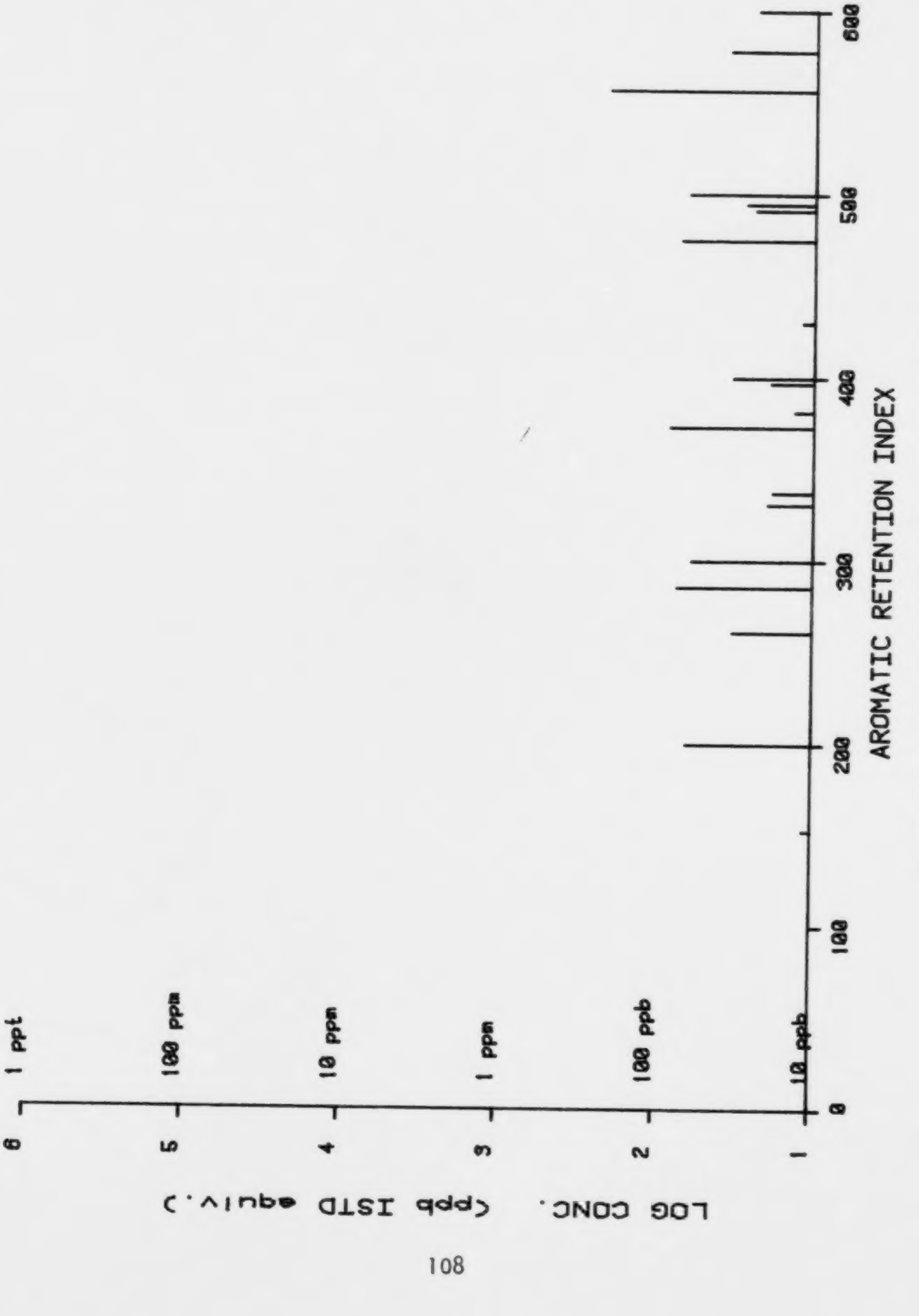
SEDIMENT, FID, STATION 15, FALL 1979



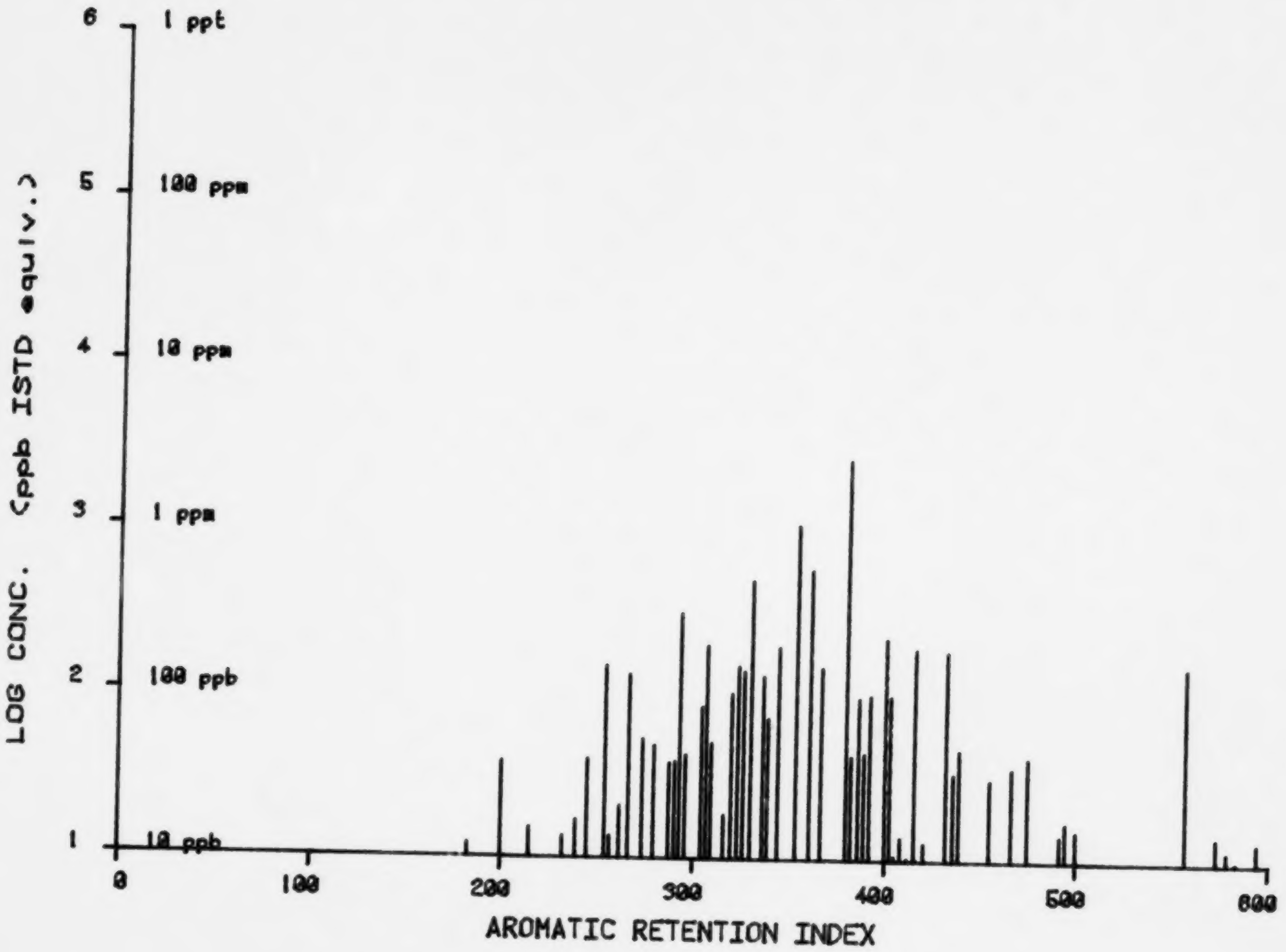
SEDIMENT, FID, STATION 16, FALL 1979



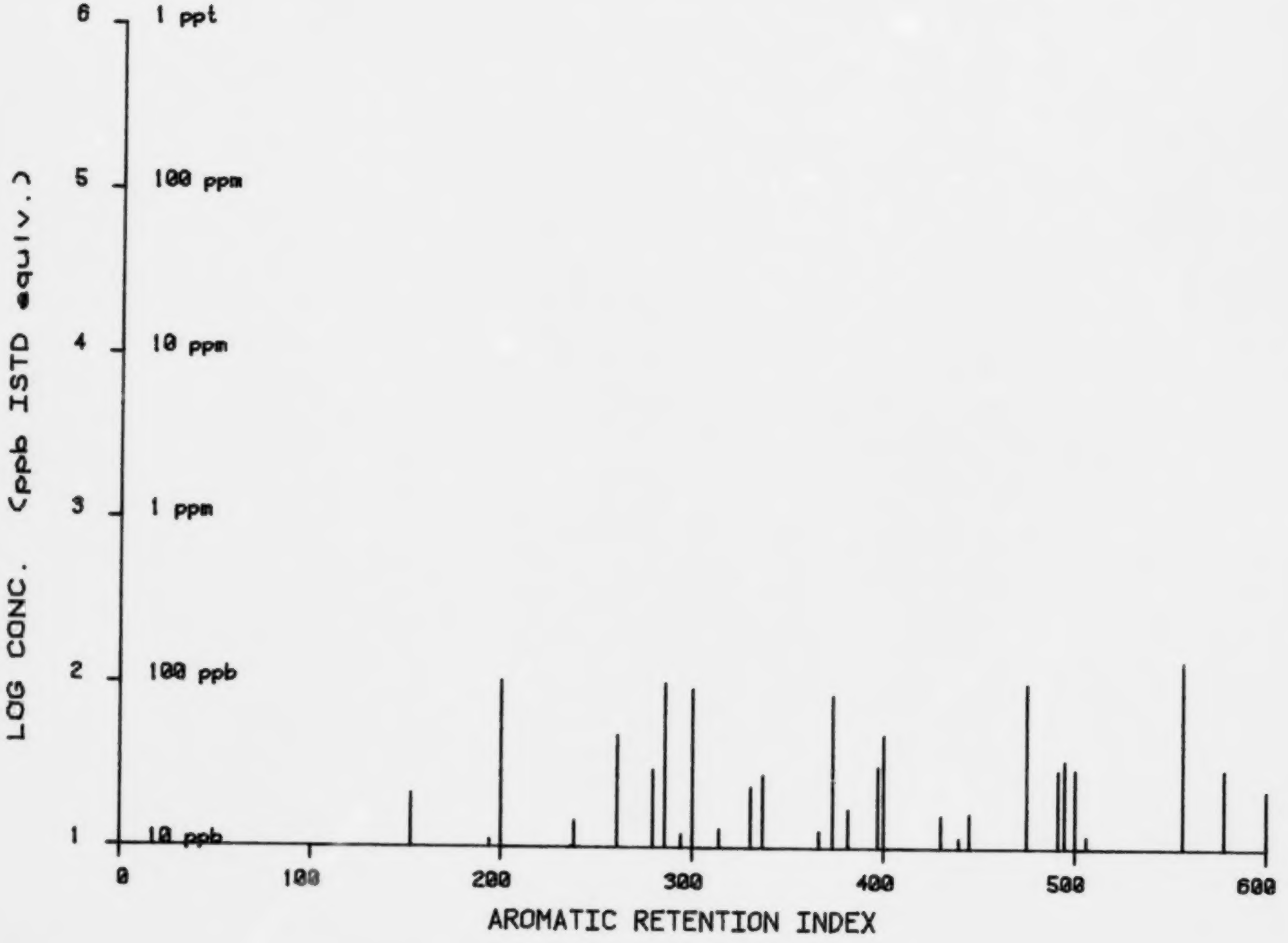
SEDIMENT, FID, STATION 17, FALL 1979



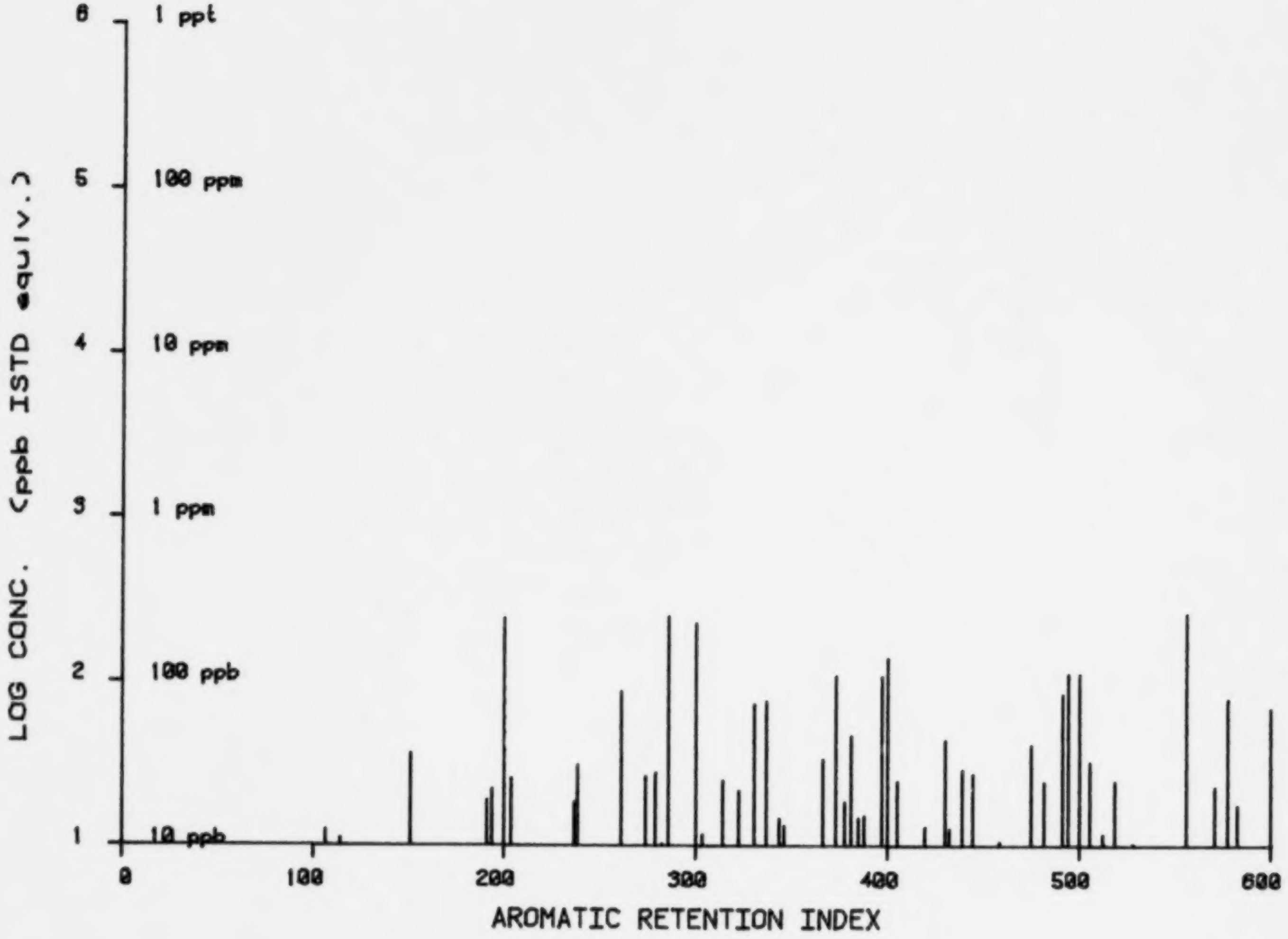
SEDIMENT, FID, STATION 18, FALL 1979



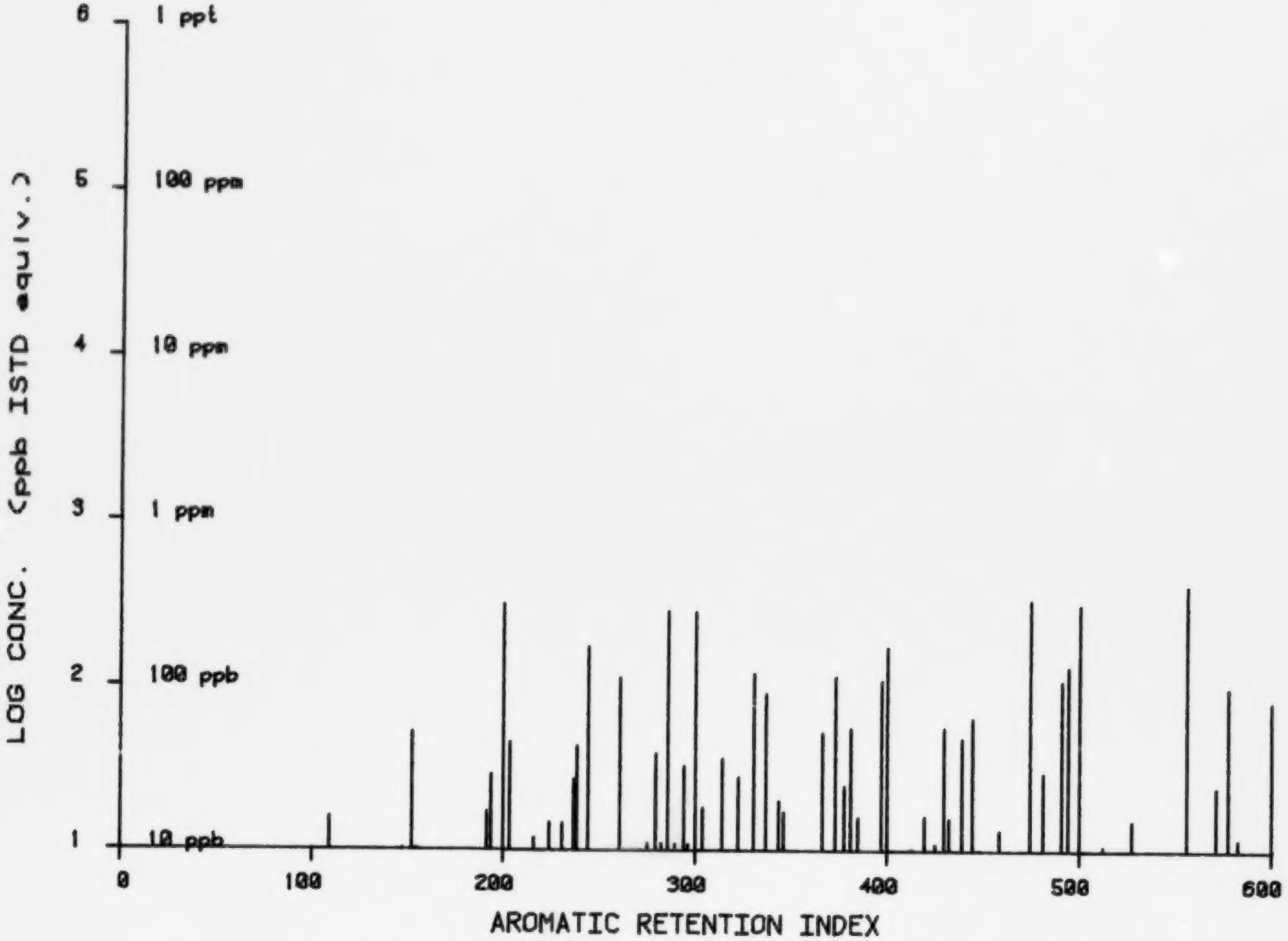
SEDIMENT, FID, STATION 19, FALL 1979



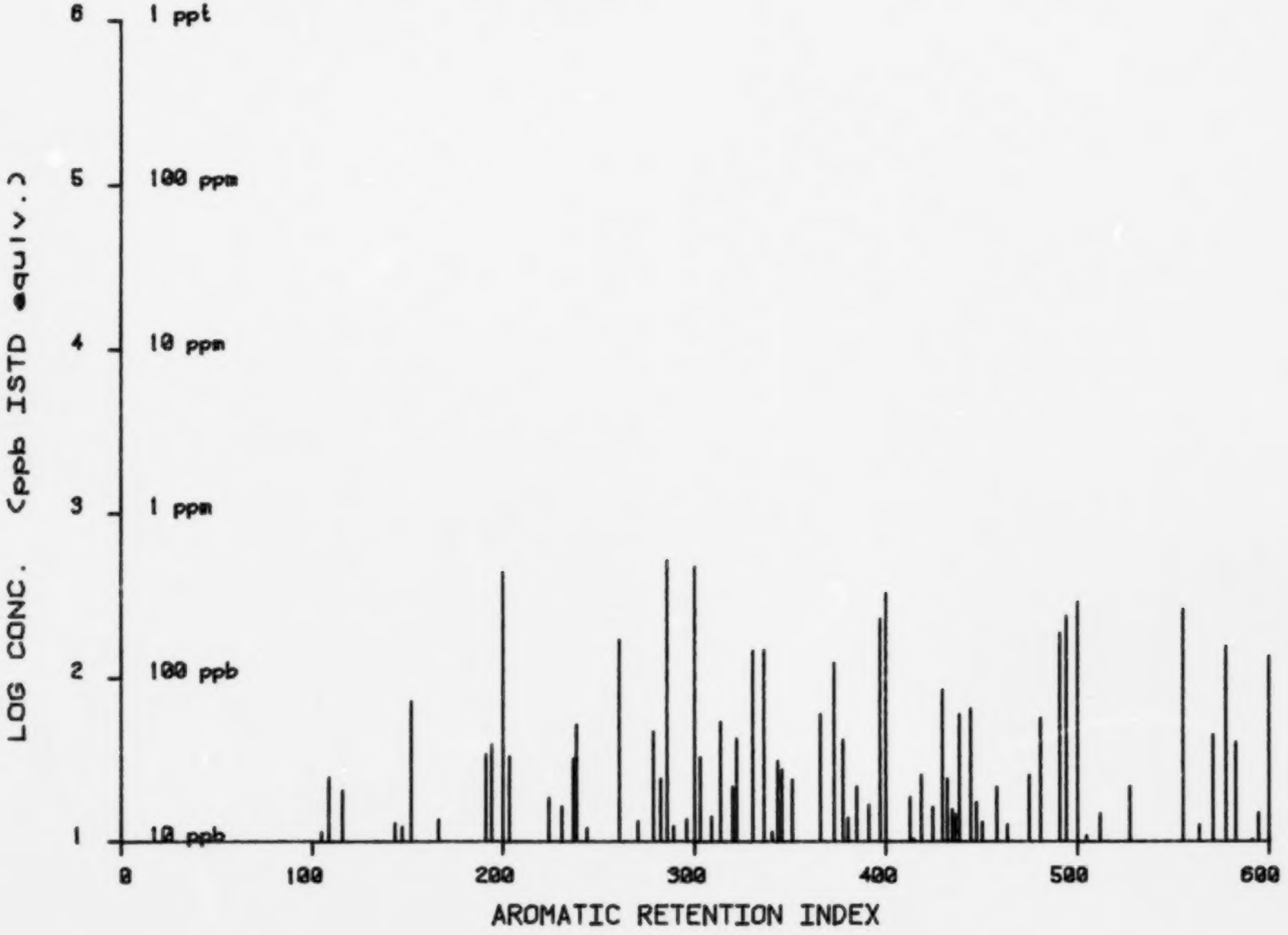
SEDIMENT, FID, STATION 20, FALL 1979



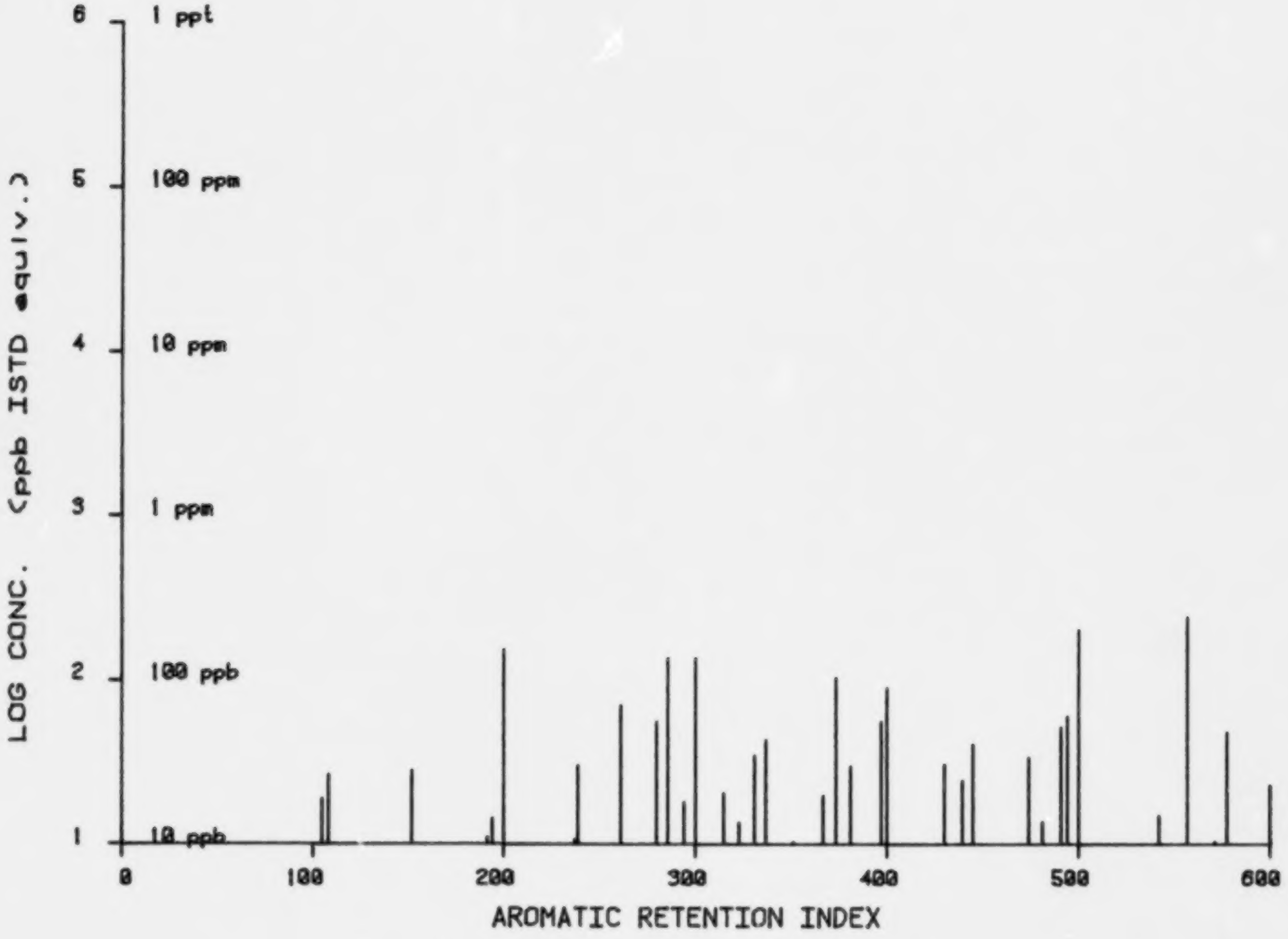
SEDIMENT, FID, STATION 21, FALL 1979



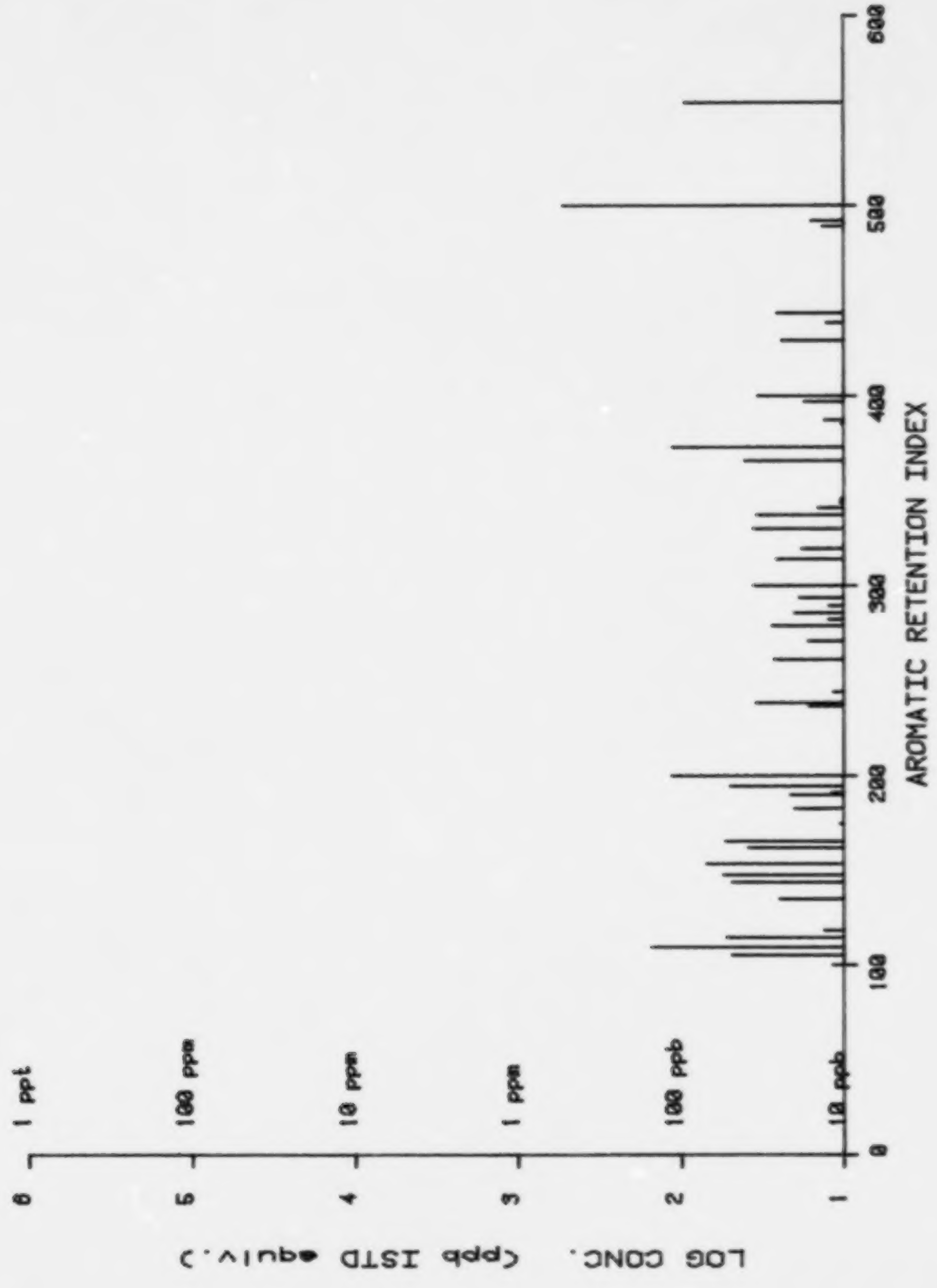
SEDIMENT, FID, STATION 22, FALL 1979



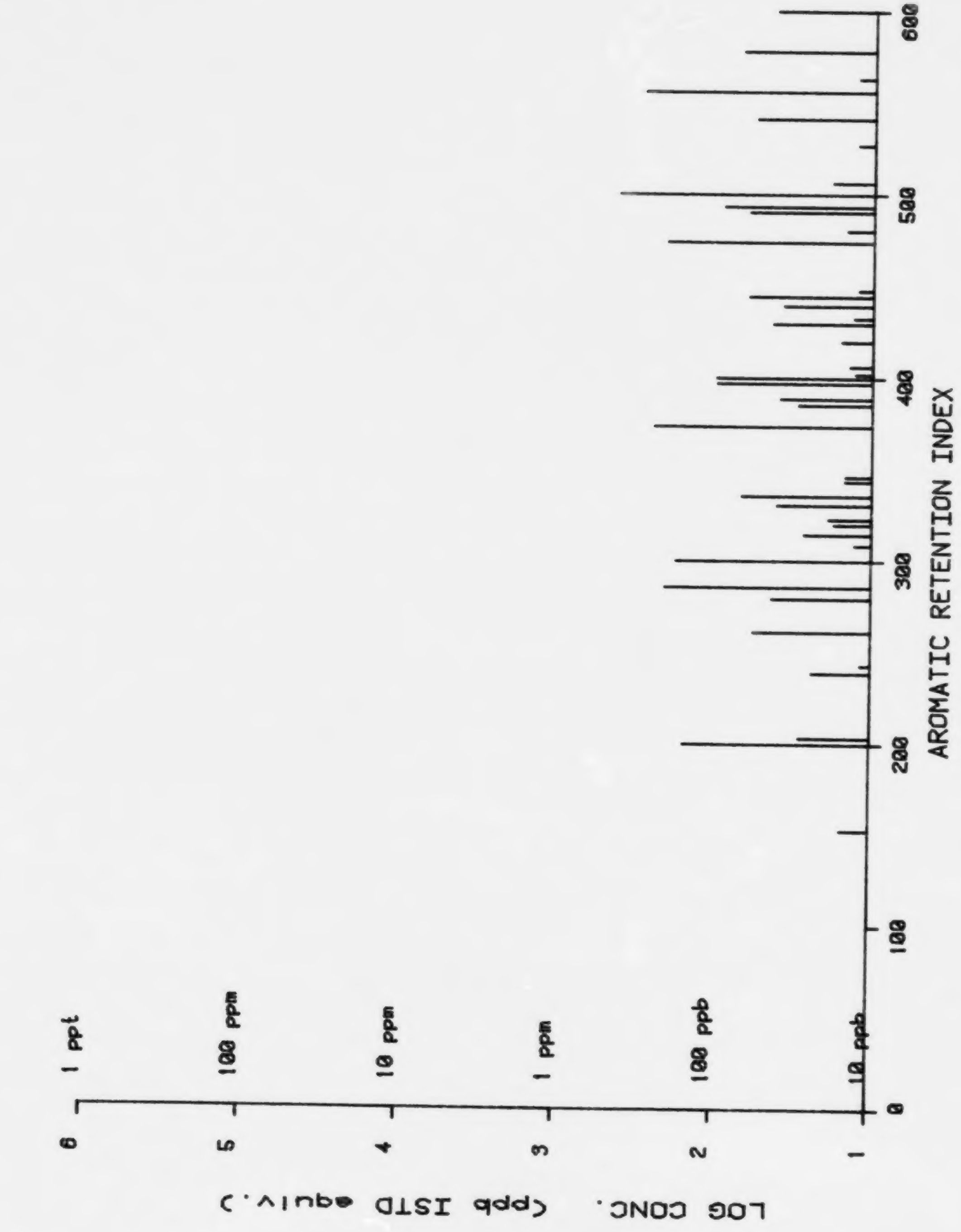
SEDIMENT, FID, STATION 23, FALL 1979



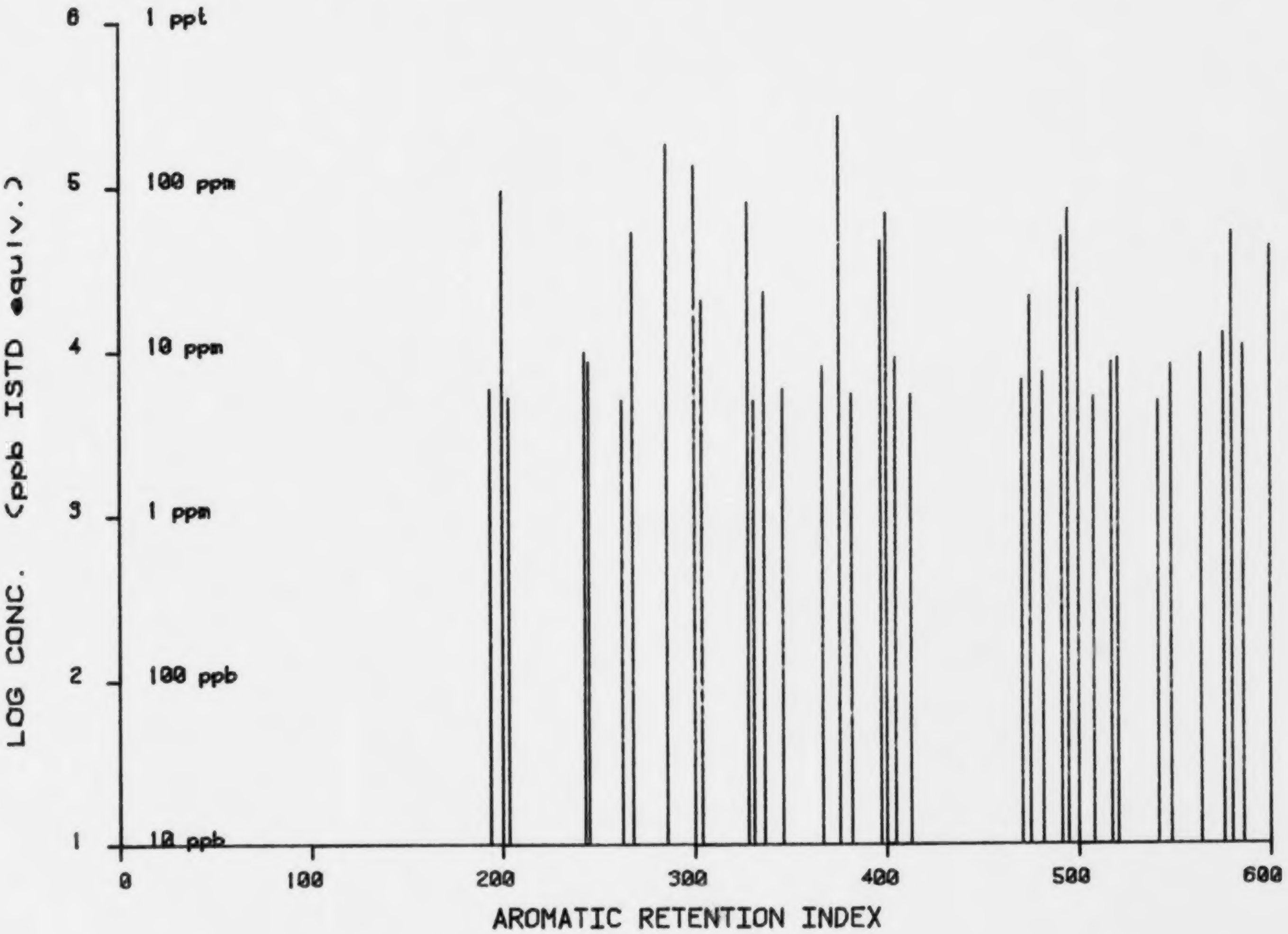
SEDIMENT, FID, STATION 24, FALL 1979



SEDIMENT, FID, STATION 25, FALL 1979



SEDIMENT, FID, STATION 26, FALL 1979



SEDIMENT, FID, STATION 27, FALL 1979

APPENDIX IV

Search for compounds > 50 ppb
in sediments (spring and fall).

```
SAMPLE : SEDIMENT, STATION 01, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI
INDEX            CONC >50 ppb
                 a,a'-Binaphthyl EQUIV
----------       ---------------------

285.487          88.9295
300              63.2014
397.007          57.6915
400              63.2782

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 03, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI              CONC >50 ppb
INDEX            a,a'-Binaphthyl EQUIV
----------       ---------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 05, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI              CONC >50 ppb
INDEX            α,α'-Binaphthyl EQUIV
----------       ---------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 08, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
----------      ---------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 09, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI              CONC >50 ppb
INDEX            α,α'-Binaphthyl EQUIV
----------       ---------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 11, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          a,a'-Binaphthyl EQUIV
----------     ---------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 12, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
----------      ---------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 13, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI          CONC >50 ppb
INDEX        a,a'-Binaphthyl EQUIV
----------   ---------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 14, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          a,a'-Binaphthyl EQUIV
----------     ---------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 15, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI           CONC >50 ppb
INDEX         a,a'-Binaphthyl EQUIV
----------    --------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 16, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
----------      ---------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 17, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           α,α'-Binaphthyl EQUIV
----------      ---------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 18, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED


ARI          CONC >50 ppb
INDEX        a,a'-Binaphthyl EQUIV
----------   --------------------

200          56.9635
285.529      78.2429
300          56.3332

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 19, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          α,α'-Binaphthyl EQUIV
----------     --------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 20, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED


ARI               CONC >50 ppb
INDEX             α,α'-Binaphthyl EQUIV
----------        -------------------

200               126.586
260.825           59.347
285.452           136.13
300               119.086
400               75.9813
474.699           141.913
578.401           62.0097

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 21, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          α,α'-Binaphthyl EQUIV
----------     ---------------------

200            235.264
260.823        147.879
285.621        411.359
300            381.924
330.186        129.061
365.912        52.2974
371.04         79.7164
397.05         160.94
400            237.705
429.951        70.8388
438.907        55.3971
445.088        51.3244
491.363        146.541
494.48         162.573
500            149.42
578.284        154.11
600            123.049

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 22, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
----------      --------------------

152.069         54.3449
191.043         51.5348
200             364.922
203.231         63.1411
238.385         67.7659
260.837         178.639
278.539         56.1287
285.516         459.957
300             396.946
313.891         57.9567
330.194         144.536
336.739         125.802
371.223         66.9015
397.067         106.663
400             162.52
429.959         50.6932
445.219         82.396
491.265         61.6474
494.19          67.8957
500             143.938
578.255         64.3745

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 23, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          α,α'-Binaphthyl EQUIV
----------     ---------------------

150.976        57.1081
200            464.304
203.049        74.4993
238.156        62.8418
260.718        175.632
285.568        551.158
300            506.16
313.682        50.336
330.085        164.026
365.864        57.9902
380.128        96.899
396.867        229.685
400            323.317
429.651        84.4736
438.779        54.618
444.521        57.4515
480.883        66.809
491.117        212.995
494.379        275.411
500            313.238
577.926        216.017
582.367        53.045
600            181.107

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 24, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           α,α'-Binaphthyl EQUIV
----------      ---------------------

200             303.033
261.192         108.05
285.503         199.493
300             179.15
330.588         51.0962

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 25, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED


ARI               CONC >50 ppb
INDEX             α,α'-Binaphthyl EQUIV
----------        ---------------------

200.004           87.4634
285.565           81.2207
300.091           84.8298
388.346           59.0222
400.028           57.7327
473.314           95.9435
500               418.534

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 26, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          a,a'-Binaphthyl EQUIV
----------     --------------------

152.378        52.8229
200            360.498
203.219        68.4092
238.265        50.4634
260.696        138.077
285.519        602.341
292.32         59.906
300            525.132
313.83         54.6565
330.254        183.701
335.477        187.97
365.81         55.5778
371.287        66.9626
377.516        51.3845
397.079        262.929
400            329.852
429.183        106.36
444.322        139.903
479.72         55.5242
489.899        168.828
493.186        219.317
500            1008.74
578.3          141.455
600            81.518

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 27, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          α,α'-Binaphthyl EQUIV
----------     ---------------------

375.025        66.6669

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 01, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED


ARI           CONC >50 ppb
INDEX         a,a'-Binaphthyl EQUIV
----------    --------------------


END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 03, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI               CONC >50 ppb
INDEX             a,a'-Binaphthyl EQUIV
----------        ---------------------

200               60.3659
285.478           63.5132
300               55.5688
400               53.6362
474.374           57

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 05, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI          CONC >50 ppb
INDEX        a,a'-Binaphthyl EQUIV
----------   ---------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 08, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI                CONC >50 ppb
INDEX              a,a'-Binaphthyl EQUIV
----------         --------------------

285.477            60.4872
300                67.5275
474.473            85.7978

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 09, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI              CONC >50 ppb
INDEX            a,a'-Binaphthyl EQUIV
-----------      ---------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 11, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI              CONC >50 ppb
INDEX            a,a'-Binaphthyl EQUIV
----------       --------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 12, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI          CONC >50 ppb
INDEX        α,α'-Binaphthyl EQUIV
----------   --------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 13, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI          CONC >50 ppb
INDEX        a,a'-Binaphthyl EQUIV
----------   --------------------

285.273      59.9932

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 14, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          a,a'-Binaphthyl EQUIV
----------     ---------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 15, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI              CONC >50 ppb
INDEX            a,a'-Binaphthyl EQUIV
----------       ---------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 16, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          α,α'-Binaphthyl EQUIV
----------     ---------------------

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 17, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI                 CONC >50 ppb
INDEX               α,α'-Binaphthyl EQUIV
-----------         ---------------------

285.561             75.1459
300                 66.61
474.341             89.0184

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 18, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI           CONC >50 ppb
INDEX         a,a'-Binaphthyl EQUIV
----------    --------------------

200           63.4941
285.571       73.2589
300           59.1584
474.624       70.989
500           63.4405

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 19, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI          CONC >50 ppb
INDEX        α,α'-Binaphthyl EQUIV
----------   --------------------

254.087      146.403
266.364      131.6
273.291      52.4992
292.929      308.98
304.528      82.6998
306.998      197.52
309.644      50.6723
319.712      100.873
323.173      149.529
326.267      139.113
330.05       492.836
336.312      130.263
338.937      71.9535
344.604      195.634
353.691      1082.06
360.741      578.07
367.063      147.881
379.893      2713.32
386.595      96.8765
392.313      100.929
400          224.201
402.626      99.8399
415.683      194.126
431.702      188.946

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 20, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI              CONC >50 ppb
INDEX            a,a'-Binaphthyl EQUIV
----------       ---------------------

200              102.423
285.5            100.344
300              91.9317
474.609          100.878

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 21, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI              CONC >50 ppb
INDEX            a,a'-Binaphthyl EQUIV
----------       ---------------------

200              239.929
261.077          86.9043
285.493          250.369
300              227.941
330.414          72.0331
336.762          75.5759
397.128          107.318
400              138.402
491.325          83.8191
494.385          111.348
500              112.043
578.019          78.5217
600              69.4414

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 22, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          a,a'-Binaphthyl EQUIV
----------     --------------------

152.108        52.1963
200.           314.024
244.163        174.472
260.919        113.021
285.644        288.378
300            284.6
330.32         119.909
336.776        89.7455
366.148        52.4445
381.043        54.9742
397.099        108.295
400            173.095
429.803        55.8995
444.6          63.9264
474.54         336.257
490.942        107.929
494.085        132.941
500            316.044
577.885        98.6919
600            80.8685

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 23, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          a,a'-Binaphthyl EQUIV
----------     -------------------

151.873        71.4368
200            439.021
238.16         51.5565
260.697        171.253
285.531        521.783
300            479.568
313.705        53.7959
330.172        146.344
336.479        147.602
365.851        59.7468
397.009        227.807
400            321.807
429.698        83.6682
438.647        59.8548
444.535        65.1031
480.737        56.3829
490.982        187.317
494.226        238.363
500            288.597
578.135        155.151
600            136.336

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 24, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
---------       -------------------

200             153.315
261.21          70.3434
279.619         55.9801
285.504         137.857
300             137.176
397.168         55.9481
400             89.6381
491.028         51.3294
494.109         60.3286
500             205.182

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 25, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI
INDEX             CONC >50 ppb
                  a,a'-Binaphthyl EQUIV
----------        --------------------

109.72            153.342
114.601           52.7378
147.535           55.0794
153.421           70.3381
165.362           53.1291
194.488           50.0966
200               113.994
500               536.07

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 26, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          a,a'-Binaphthyl EQUIV
----------     ---------------------

200            155.49
261.214        55.9277
285.502        205.988
300            175.731
335.632        67.1753
397.237        97.4446
400            99.2264
444.631        62.2043
473.881        207.111
490.424        62.0388
493.449        89.9268
500            418.654
541.494        55.8145
578.367        68.533

END OF FILE
```

```
SAMPLE : SEDIMENT, STATION 27, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI              CONC >50 ppb
INDEX            α,α'-Binaphthyl EQUIV
----------       --------------------

193.802          5892.59
200              95189.8
203.279          5246.61
243.082          9845.9
245.182          8574.81
262.562          5051.05
267.887          52947.9
285.787          182264.
300              133788.
303.732          20532.1
327.987          80387.7
330.985          4997.32
336.358          23003.6
345.824          5922.38
366.765          8205.74
375.584          267856.
381.918          5548.66
397.266          46547.1
400              68479.9
404.658          9089.61
412.902          5482.4
470.602          6724.3
474.828          21592.7
481.489          7425.44
491.419          49416.2
494.428          72844.7
500              23763.1
508.071          5298.99
517.377          8496.76
520.965          9038.8
541.729          5028.99
548.726          8227.5
564.521          9518.78
576.125          12776.1
580.249          52978.2
586.224          10793.3
600              43293.4

END OF FILE
```

APPENDIX V

Search for temporal changes between spring and fall in sediments.

```
                TIME SERIES FLAG PROGRAM

          STATION 01 SEDIMENTS   WINDOW = .75

          CONCENTRATION  (ppb)
AV ARI    SPRING         FALL          RATIO         FLAG

330.523   31.7924        1.79143       <.1           >10X DECREASE
397.051   57.6915        4.22207       <.1           >10X DECREASE
405.08    15.9289        1.18601       <.1           >10X DECREASE

END OF FILE
```

```
              TIME SERIES FLAG PROGRAM

          STATION 03 SEDIMENTS   WINDOW = .75

          CONCENTRATION  (ppb)
AV ARI    SPRING         FALL         RATIO       FLAG

474.374   -              57           >57         ** NEW CPD

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

                 STATION 05 SEDIMENTS   WINDOW = .75

                 CONCENTRATION  (ppb)
AV ARI           SPRING         FALL          RATIO          FLAG

END OF FILE
```

```
                 TIME SERIES FLAG PROGRAM

             STATION 08 SEDIMENTS   WINDOW = .75

             CONCENTRATION  (ppb)
AV ARI       SPRING         FALL          RATIO         FLAG

474.473      -              85.7978       >85           ** NEW CPD

END OF FILE
```

```
                TIME SERIES FLAG PROGRAM

             STATION 09 SEDIMENTS   WINDOW = .75

             CONCENTRATION  (ppb)
AV ARI       SPRING         FALL           RATIO          FLAG

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

               STATION 11 SEDIMENTS   WINDOW = .75

               CONCENTRATION  (ppb)
AV ARI         SPRING         FALL           RATIO          FLAG

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

                STATION 12 SEDIMENTS   WINDOW = .75

                CONCENTRATION  (ppb)
AV ARI          SPRING         FALL           RATIO          FLAG

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

                STATION 13 SEDIMENTS   WINDOW = .75

                CONCENTRATION  (ppb)
AV ARI          SPRING         FALL          RATIO          FLAG

END OF FILE
```

```
                TIME SERIES FLAG PROGRAM

             STATION 14 SEDIMENTS   WINDOW = .75

             CONCENTRATION  (ppb)
AV ARI       SPRING          FALL           RATIO           FLAG

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

                STATION 15 SEDIMENTS   WINDOW = .75

                CONCENTRATION  (ppb)
AV ARI          SPRING         FALL           RATIO          FLAG

END OF FILE
```

```
                   TIME SERIES FLAG PROGRAM

              STATION 16 SEDIMENTS   WINDOW = .75

              CONCENTRATION  (ppb)
AV ARI        SPRING         FALL           RATIO          FLAG

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

               STATION 17 SEDIMENTS   WINDOW = .75

               CONCENTRATION  (ppb)
AV ARI         SPRING         FALL           RATIO          FLAG

336.807        1.56141        21.0821        13.5           >10X INCREASE
474.341        -              89.0184        >89            ** NEW CPD

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

                STATION 18 SEDIMENTS   WINDOW = .75

                CONCENTRATION  (ppb)
AV ARI          SPRING         FALL           RATIO          FLAG

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

                 STATION 19 SEDIMENTS   WINDOW = .75

                 CONCENTRATION  (ppb)
AV ARI           SPRING         FALL           RATIO          FLAG

244.514          3.851          39.6965        10.3           >10X INCREASE
254.087          -              146.403        >146           ** NEW CPD
266.364          -              131.6          >131           ** NEW CPD
273.364          1.70615        52.4992        30.7           >10X INCREASE
292.929          -              308.98         >308           ** NEW CPD
295.881          3.39847        42.5216        12.5           >10X INCREASE
304.528          -              82.6998        >82            ** NEW CPD
306.998          -              197.52         >197           ** NEW CPD
309.644          -              50.6723        >50            ** NEW CPD
319.779          2.15813        100.873        46.7           >10X INCREASE
323.173          -              149.529        >149           ** NEW CPD
326.267          -              139.113        >139           ** NEW CPD
330.149          17.8262        492.836        27.6           >10X INCREASE
338.937          -              71.9535        >71            ** NEW CPD
344.604          -              195.634        >195           ** NEW CPD
353.691          -              1082.06        >1082          ** NEW CPD
360.741          -              578.07         >578           ** NEW CPD
367.063          -              147.881        >147           ** NEW CPD
380.175          6.60043        2713.32        411            >10X INCREASE
386.595          -              96.8765        >96            ** NEW CPD
392.313          -              100.929        >100           ** NEW CPD
402.626          -              99.8399        >99            ** NEW CPD
415.318          1.31153        194.126        148            >10X INCREASE
432.053          3.81671        188.946        49.5           >10X INCREASE
435.78           1.16099        34.0763        29.3           >10X INCREASE
466.584          3.07643        36.9269        12             >10X INCREASE

END OF FILE
```

```
                     TIME SERIES FLAG PROGRAM

                 STATION 20 SEDIMENTS   WINDOW = .75

                 CONCENTRATION  (ppb)
AV ARI           SPRING         FALL           RATIO          FLAG

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

               STATION 21 SEDIMENTS   WINDOW = .75

               CONCENTRATION  (ppb)
AV ARI         SPRING         FALL           RATIO          FLAG

371.04         79.7164        -              <.1            >10X DECREASE

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

                STATION 22 SEDIMENTS   WINDOW = .75

                CONCENTRATION  (ppb)
AV ARI          SPRING         FALL           RATIO          FLAG

371.223         66.9015        -              <.1            >10X DECREASE
474.622         3.94064        336.257        85.3           >10X INCREASE

END OF FILE
```

```
                TIME SERIES FLAG PROGRAM

           STATION 23 SEDIMENTS   WINDOW = .75

           CONCENTRATION  (ppb)
AV ARI     SPRING         FALL           RATIO          FLAG

150.976    57.1081        -              <.1            >10X DECREASE
151.873    -              71.4368        >71            ** NEW CPD
336.474    14.2342        147.602        10.3           >10X INCREASE

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

               STATION 24 SEDIMENTS   WINDOW = .75

               CONCENTRATION  (ppb)
AV ARI         SPRING         FALL            RATIO           FLAG

273.841        28.0535        2.43725         <.1             >10X DECREASE

END OF FILE
```

```
                 TIME SERIES FLAG PROGRAM

            STATION 25 SEDIMENTS   WINDOW = .75

            CONCENTRATION  (ppb)
AV ARI      SPRING         FALL           RATIO          FLAG

105.366     3.62953        48.6644        13.4           >10X INCREASE
109.407     6.39906        153.342        23.9           >10X INCREASE
114.29      1.2516         52.7378        42.1           >10X INCREASE
143.601     4.70631        48.418         10.2           >10X INCREASE
147.376     4.48022        55.0794        12.2           >10X INCREASE
153.421     -              70.3381        >70            ** NEW CPD
165.477     1.86887        53.1291        28.4           >10X INCREASE
473.057     95.9435        6.89515        <.1            >10X DECREASE
599.955     29.1972        2.65352        <.1            >10X DECREASE

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

              STATION 26 SEDIMENTS   WINDOW = .75

              CONCENTRATION  (ppb)
AV ARI        SPRING         FALL           RATIO          FLAG

117.224       18.7656        1.33851        <.1            >10X DECREASE
183.578       11.5578        1.15065        <.1            >10X DECREASE
292.655       59.906         4.40382        <.1            >10X DECREASE
302.834       49.2566        1.56597        <.1            >10X DECREASE
332.695       19.4245        1.27307        <.1            >10X DECREASE
365.908       55.5778        1.78217        <.1            >10X DECREASE
371.287       66.9626        -              <.1            >10X DECREASE
439.198       2.4119         36.9465        15.3           >10X INCREASE
571.478       21.5162        1.95541        <.1            >10X DECREASE

END OF FILE
```

```
                 TIME SERIES FLAG PROGRAM

              STATION 27 SEDIMENTS   WINDOW = .75

              CONCENTRATION  (ppb)
AV ARI        SPRING         FALL          RATIO          FLAG

193.802       -              5892.59       >5892          ** NEW CPD
200           4.82297        95189.8       19736.7        >10X INCREASE
203.279       -              5246.61       >5246          ** NEW CPD
243.082       -              9845.9        >9845          ** NEW CPD
245.182       -              8574.81       >8574          ** NEW CPD
262.557       1.51294        5051.05       3338.5         >10X INCREASE
267.887       -              52947.9       >52947.        ** NEW CPD
285.76        3.48316        182264.       52327.1        >10X INCREASE
300           3.36759        133788.       39728.1        >10X INCREASE
303.732       -              20532.1       >20532         ** NEW CPD
327.987       -              80387.7       >80387.        ** NEW CPD
331.094       1.195          4997.32       4181.8         >10X INCREASE
336.358       -              23003.6       >23003         ** NEW CPD
345.824       -              5922.38       >5922          ** NEW CPD
366.765       -              8205.74       >8205          ** NEW CPD
375.305       66.6669        267856.       4017.8         >10X INCREASE
381.918       -              5548.66       >5548          ** NEW CPD
397.266       -              46547.1       >46547.        ** NEW CPD
400           4.44343        68479.9       15411.4        >10X INCREASE
404.497       1.12734        9089.61       8062.8         >10X INCREASE
412.902       -              5482.4        >5482          ** NEW CPD
470.427       1.79372        6724.3        3748.8         >10X INCREASE
474.828       -              21592.7       >21592         ** NEW CPD
481.489       -              7425.44       >7425          ** NEW CPD
491.419       -              49416.2       >49416.        ** NEW CPD
494.331       3.0854         72844.7       23609.4        >10X INCREASE
500           2.9916         23763.1       7943.2         >10X INCREASE
508.071       -              5298.99       >5298          ** NEW CPD
517.377       -              8496.76       >8496          ** NEW CPD
520.965       -              9038.8        >9038          ** NEW CPD
541.729       -              5028.99       >5028          ** NEW CPD
548.726       -              8227.5        >8227          ** NEW CPD
564.521       -              9518.78       >9518          ** NEW CPD
576.125       -              12776.1       >12776         ** NEW CPD
580.249       -              52978.2       >52978.        ** NEW CPD
586.224       -              10793.3       >10793         ** NEW CPD

END OF FILE
```

APPENDIX VI

Search for compounds $>$ 50 ppb in oyster tissue (spring and fall).

```
SAMPLE : OYSTER, STATION 01, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED


ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
----------      ---------------------
```

```
SAMPLE : OYSTER, STATION 02, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
-----------     ----------------------

END OF FILE
```

```
SAMPLE : OYSTER, STATION 03, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
-----------     ----------------------

END OF FILE
```

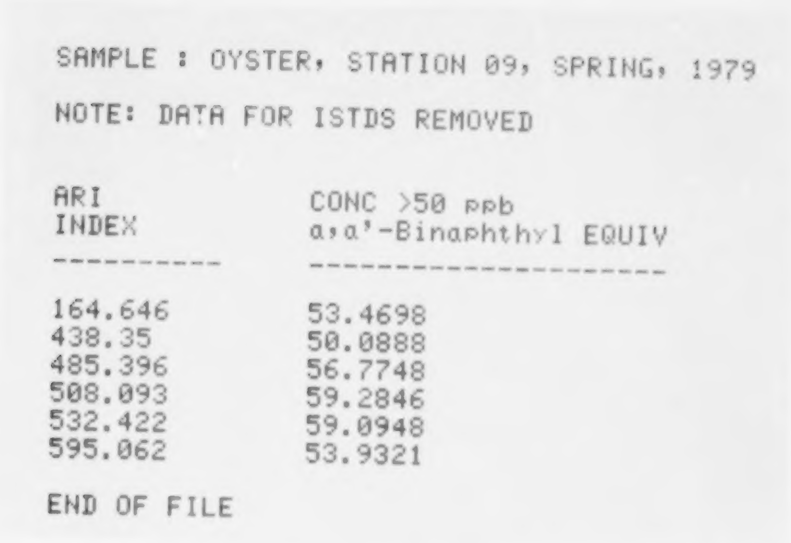
```
SAMPLE : OYSTER, STATION 04, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
----------      ----------------------

END OF FILE
```

```
SAMPLE : OYSTER, STATION 05, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          a,a'-Binaphthyl EQUIV
----------     --------------------

532.24         51.1601

END OF FILE
```

```
SAMPLE : OYSTER, STATION 06, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
----------      ---------------------

484.775         50.4601
507.317         61.6324
531.811         64.559
594.186         51.3604

END OF FILE
```

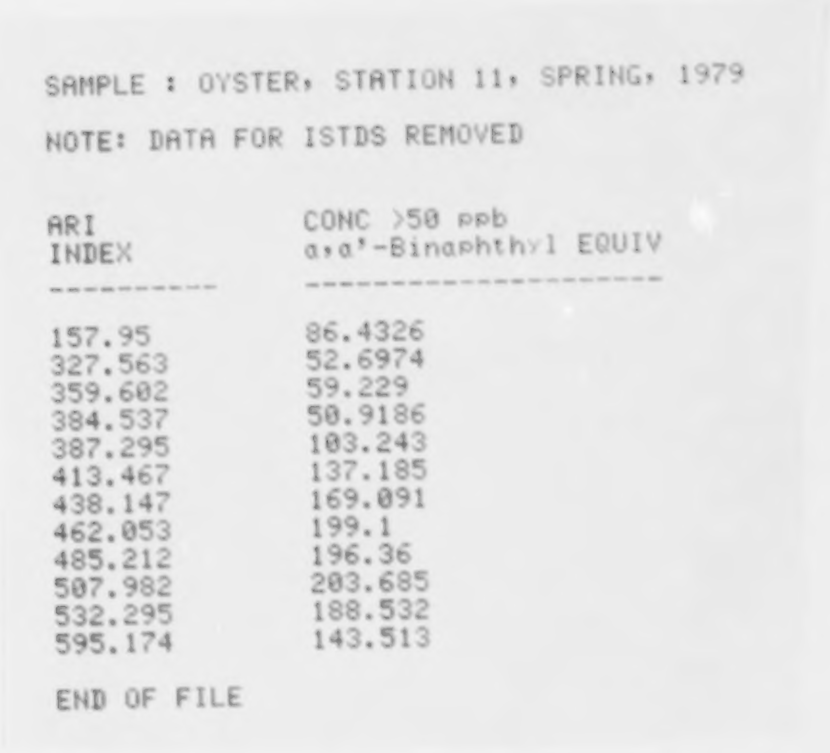
```
SAMPLE : OYSTER, STATION 07, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI           CONC >50 ppb
INDEX         a,a'-Binaphthyl EQUIV
----------    --------------------

141.131       477.223
191.112       165.688
251.392       132.749

END OF FILE
```

```
SAMPLE : OYSTER, STATION 08, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          a,a’-Binaphthyl EQUIV
----------     ---------------------

141.018        104.044

END OF FILE
```



```
SAMPLE : OYSTER, STATION 09, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI           CONC >50 ppb
INDEX         a,a'-Binaphthyl EQUIV
----------    ---------------------

164.646       53.4698
438.35        50.0888
485.396       56.7748
508.093       59.2846
532.422       59.0948
595.062       53.9321

END OF FILE
```

```
SAMPLE : OYSTER, STATION 10, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          a,a'-Binaphthyl EQUIV
----------     ---------------------

104.2          105.752
138.14         144.484
141.116        163.894
158.908        55.624
161.478        50.6161
193.51         136.186
255.642        86.7363
265.201        72.8197
391.673        52.6317
429.942        55.9846
517.013        72.3825
563.821        2766.62
565.432        1716.84
572.558        103.373

END OF FILE
```



```
SAMPLE : OYSTER, STATION 11, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
----------      --------------------

157.95          86.4326
327.563         52.6974
359.602         59.229
384.537         50.9186
387.295         103.243
413.467         137.185
438.147         169.091
462.053         199.1
485.212         196.36
507.982         203.685
532.295         188.532
595.174         143.513

END OF FILE
```

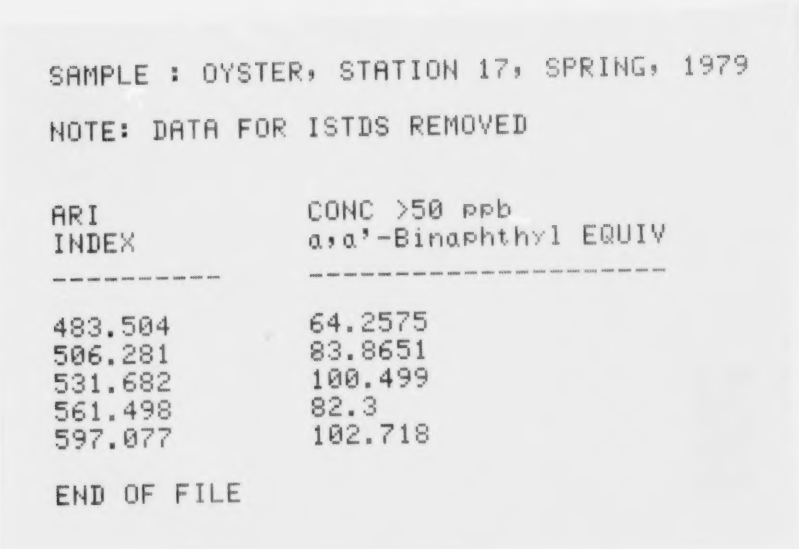
```
SAMPLE : OYSTER, STATION 12, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          a,a'-Binaphthyl EQUIV
----------     --------------------

140.373        158.29
507.268        56.8423
531.843        62.3726
596.063        61.8668

END OF FILE
```

```
SAMPLE : OYSTER, STATION 13, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED


ARI              CONC >50 ppb
INDEX            a,a'-Binaphthyl EQUIV
-----------      ----------------------

386.733          150.296
412.967          187.881
437.449          210.182
461.389          196.415
484.583          179.476
507.312          161.775
532.079          162.181

END OF FILE
```

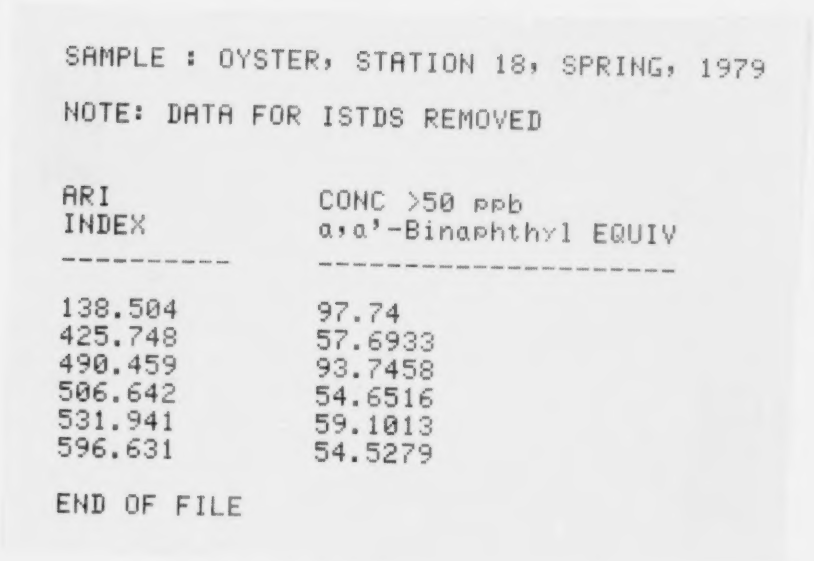
```
SAMPLE : OYSTER, STATION 14, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI               CONC >50 ppb
INDEX             α,α'-Binaphthyl EQUIV
----------        ---------------------

139.348           138.337
509.351           51.1341
533.031           57.4857
594.329           56.9999

END OF FILE
```

```
SAMPLE : OYSTER, STATION 15, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          a,a'-Binaphthyl EQUIV
----------     --------------------

138.976        245.883

END OF FILE
```

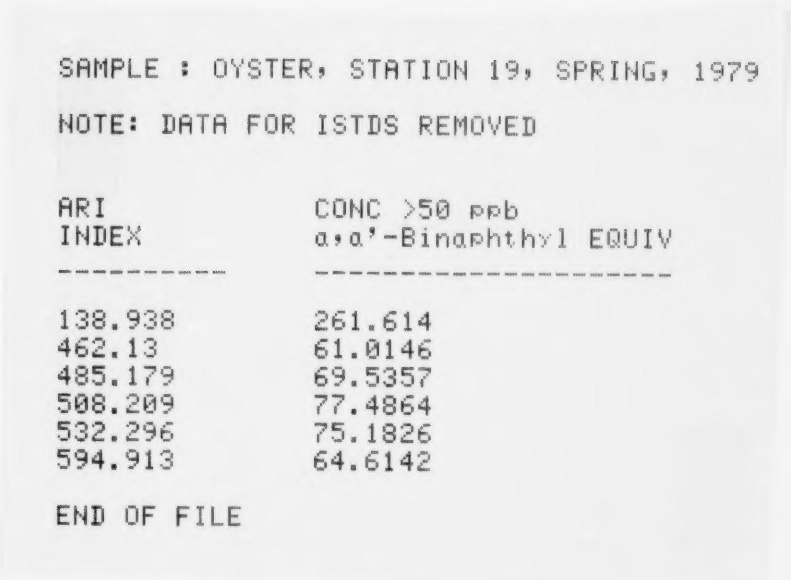
```
SAMPLE : OYSTER, STATION 16, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED


ARI            CONC >50 ppb
INDEX          α,α'-Binaphthyl EQUIV
----------     ---------------------


END OF FILE
```



```
SAMPLE : OYSTER, STATION 17, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI           CONC >50 ppb
INDEX         a,a'-Binaphthyl EQUIV
----------    ---------------------

483.504       64.2575
506.281       83.8651
531.682       100.499
561.498       82.3
597.077       102.718

END OF FILE
```



```
SAMPLE : OYSTER, STATION 18, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI          CONC >50 ppb
INDEX        a,a'-Binaphthyl EQUIV
----------   ---------------------

138.504      97.74
425.748      57.6933
490.459      93.7458
506.642      54.6516
531.941      59.1013
596.631      54.5279

END OF FILE
```



```
SAMPLE : OYSTER, STATION 19, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED


ARI            CONC >50 ppb
INDEX          a,a'-Binaphthyl EQUIV
----------     ---------------------

138.938        261.614
462.13         61.0146
485.179        69.5357
508.209        77.4864
532.296        75.1826
594.913        64.6142

END OF FILE
```

```
SAMPLE : OYSTER, STATION 20, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI           CONC >50 ppb
INDEX         α,α'-Binaphthyl EQUIV
----------    ----------------------

140.964       51.5981

END OF FILE
```

```
SAMPLE : OYSTER, STATION 21, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED


ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
----------      ---------------------

END OF FILE
```

```
SAMPLE : OYSTER, STATION 22, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED


ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
----------      ---------------------

139.405         104.834
285.161         63.2255

END OF FILE
```

```
SAMPLE : OYSTER, STATION 23, SPRING, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI              CONC >50 ppb
INDEX            α,α'-Binaphthyl EQUIV
----------       --------------------

140.274          96.7634

END OF FILE
```

```
SAMPLE : OYSTER, STATION 01, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
----------      ---------------------

273.407         78.7995
504.209         124.201

END OF FILE
```

```
SAMPLE : OYSTER, STATION 02, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI           CONC >50 ppb
INDEX         a,a'-Binaphthyl EQUIV
----------    ---------------------

505.805       88.5895

END OF FILE
```

```
SAMPLE : OYSTER, STATION 03, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED


ARI              CONC >50 ppb
INDEX            a,a'-Binaphthyl EQUIV
----------       ---------------------

156.694          226.501
260.376          110.926
267.234          61.015
277.819          65.2924
281.41           59.0309
283.993          103.706
288.638          92.5358
294.606          59.4606
298.287          138.335
307.499          97.5764
311.394          77.2618
314.219          81.7873
506.176          62.9797

END OF FILE
```

```
SAMPLE : OYSTER, STATION 04, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI              CONC >50 ppb
INDEX            α,α'-Binaphthyl EQUIV
----------       ---------------------

506.585          78.0285

END OF FILE
```

```
SAMPLE : OYSTER, STATION 05, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED


ARI            CONC >50 ppb
INDEX          a,a'-Binaphthyl EQUIV
----------     ---------------------

243.866        82.7122
284.755        151.714
298.869        63.766
397.391        67.0185
473.035        51.2544
505.303        97.5016

END OF FILE
```

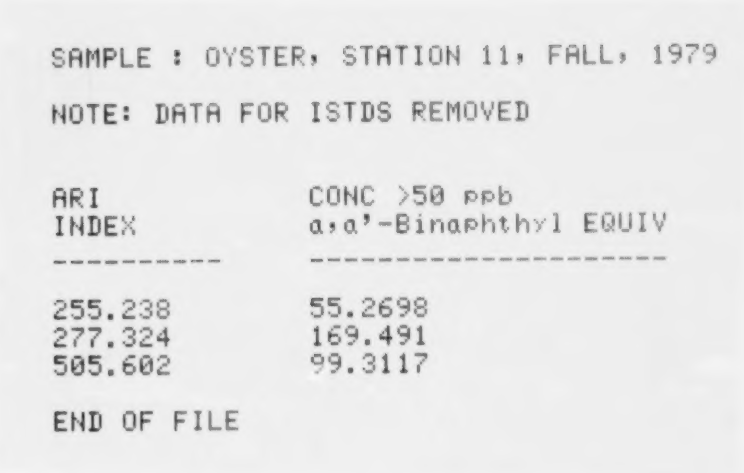
```
SAMPLE : OYSTER, STATION 06, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI           CONC >50 ppb
INDEX         a,a'-Binaphthyl EQUIV
----------    --------------------

505.129       72.2464

END OF FILE
```

```
SAMPLE : OYSTER, STATION 07, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI              CONC >50 ppb
INDEX            α,α'-Binaphthyl EQUIV
----------       ---------------------

139.923          143.851
254.933          70.0338
277.3            159.052
505.323          95.2445

END OF FILE
```

```
SAMPLE : OYSTER, STATION 08, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
----------      ----------------------

505.625         73.3733

END OF FILE
```

```
SAMPLE : OYSTER, STATION 09, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI              CONC >50 ppb
INDEX            a,a'-Binaphthyl EQUIV
----------       ----------------------

255.471          50.9173
277.447          180.294
505.355          105.907

END OF FILE
```

```
SAMPLE : OYSTER, STATION 10, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI          CONC >50 ppb
INDEX        α,α'-Binaphthyl EQUIV
----------   ---------------------

505.24       70.8346

END OF FILE
```



```
SAMPLE : OYSTER, STATION 11, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
----------      ---------------------

255.238         55.2698
277.324         169.491
505.602         99.3117

END OF FILE
```

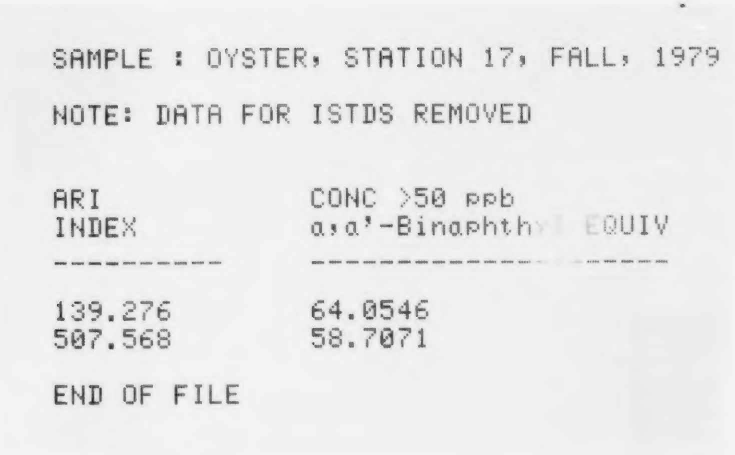
```
SAMPLE : OYSTER, STATION 12, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI          CONC >50 ppb
INDEX        a,a'-Binaphthyl EQUIV
----------   ---------------------

END OF FILE
```

```
SAMPLE : OYSTER, STATION 13, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          a,a'-Binaphthyl EQUIV
----------     ---------------------

255.118        50.9797
505.731        78.0888

END OF FILE
```

```
SAMPLE : OYSTER, STATION 14, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED


ARI               CONC >50 ppb
INDEX             a,a'-Binaphthyl EQUIV
----------        ---------------------

255.411           75.1441
277.634           53.8855
505.063           87.0265

END OF FILE
```

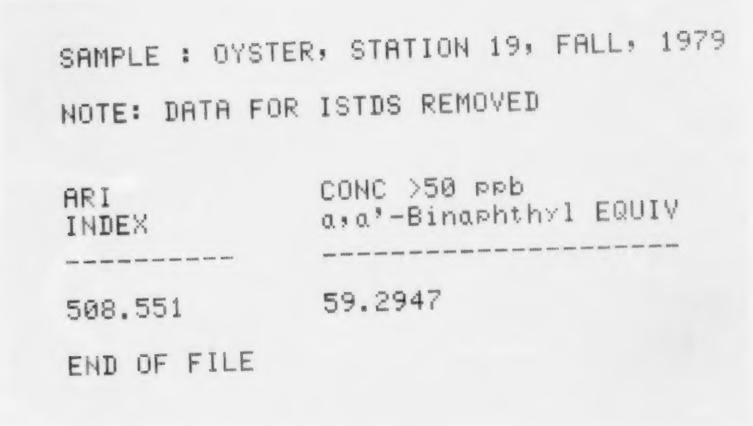
```
SAMPLE : OYSTER, STATION 15, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI            CONC >50 ppb
INDEX          a,a'-Binaphthyl EQUIV
----------     ----------------------

139.692        188.38
255.301        86.3418
505.536        70.034

END OF FILE
```

```
SAMPLE : OYSTER, STATION 16, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED


ARI              CONC >50 ppb
INDEX            a,a'-Binaphthyl EQUIV
----------       -----------   ------

139.829          140.57
506.028          59.9921

END OF FILE
```



```
SAMPLE : OYSTER, STATION 17, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED


ARI               CONC >50 ppb
INDEX             a,a'-Binaphthyl EQUIV
-----------       ---------------------

139.276           64.0546
507.568           58.7071

END OF FILE
```

```
SAMPLE : OYSTER, STATION 18, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           α,α'-Binaphthyl EQUIV
----------      ---------------------

139.087         212.906
157.498         61.3544
254.357         73.9355

END OF FILE
```



```
SAMPLE : OYSTER, STATION 19, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
----------      ---------------------

508.551         59.2947

END OF FILE
```

```
SAMPLE : OYSTER, STATION 20, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           α,α'-Binaphthyl EQUIV
----------      ---------------------

392.555         52.1386
495.365         50.0877
508.316         83.6745
519.099         88.0041
542.182         83.4657
564.842         76.9059
592.16          70.2812

END OF FILE
```

```
SAMPLE : OYSTER, STATION 21, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED


ARI            CONC >50 ppb
INDEX          a,a'-Binaphthyl EQUIV
----------     ---------------------

137.524        54.0427
253.332        58.9127
392.926        72.0479
509.47         55.8255

END OF FILE
```

```
SAMPLE : OYSTER, STATION 22, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI           CONC >50 ppb
INDEX         α,α'-Binaphthyl EQUIV
----------    --------------------

101.403       65.7244
107.35        56.0716
138.131       67.5085
242.254       57.5532
254.061       50.2974
283.282       71.7267
366.654       59.9548
392.547       54.5296
509.45        76.7436

END OF FILE
```

```
SAMPLE : OYSTER, STATION 23, FALL, 1979

NOTE: DATA FOR ISTDS REMOVED

ARI             CONC >50 ppb
INDEX           a,a'-Binaphthyl EQUIV
----------      ---------------------

END OF FILE
```

APPENDIX VII

Search for temporal changes between spring and fall in oyster tissue.

```
NOTE:******THIS PRINTOUT REMOVES INTERNAL STANDARDS [ BINAPHTHYL,
DECACHLOROBIPHENYL, AND P-QUATERPHENYL, AND REMOVES UNMATCHED
COMPOUNDS APPEARING AT <50 PPB
```

```
                TIME SERIES FLAG PROGRAM

           STATION 01 OYSTERS   WINDOW = 1.5

           CONCENTRATION  (ppb)
AV ARI     SPRING         FALL          RATIO          FLAG

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

               STATION 02 OYSTERS   WINDOW = 1.5

               CONCENTRATION  (ppb)
AV ARI         SPRING         FALL           RATIO          FLAG

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

                STATION 03 OYSTERS   WINDOW = 1.5

                CONCENTRATION  (ppb)
AV ARI          SPRING         FALL            RATIO           FLAG

157.207         4.92068        226.501         46              >10X INCREASE
260.914         7.20963        110.926         15.3            >10X INCREASE
267.234         -              61.015          >61             ** NEW CPD
277.819         -              65.2924         >65             ** NEW CPD
281.41          -              59.0309         >59             ** NEW CPD
288.638         -              92.5358         >92             ** NEW CPD
294.606         -              59.4606         >59             ** NEW CPD
298.287         -              138.335         >138            ** NEW CPD
307.499         -              97.5764         >97             ** NEW CPD
311.394         -              77.2618         >77             ** NEW CPD
314.219         -              81.7873         >81             ** NEW CPD

END OF FILE
```

```
                   TIME SERIES FLAG PROGRAM

               STATION 04 OYSTERS   WINDOW = 1.5

               CONCENTRATION  (ppb)
AV ARI         SPRING         FALL           RATIO          FLAG

END OF FILE
```

```
                 TIME SERIES FLAG PROGRAM

             STATION 05 OYSTERS   WINDOW = 1.5

             CONCENTRATION  (ppb)
AV ARI       SPRING         FALL           RATIO          FLAG

243.866      -              82.7122        >82            ** NEW CPD
284.755      -              151.714        >151           ** NEW CPD
298.869      -              63.766         >63            ** NEW CPD
397.391      -              67.0185        >67            ** NEW CPD
532.24       51.1601        -              <.1            >10X DECREASE

END OF FILE
```

```
                 TIME SERIES FLAG PROGRAM

             STATION 06 OYSTERS   WINDOW = 1.5

             CONCENTRATION  (ppb)
AV ARI       SPRING         FALL        RATIO        FLAG

484.775      50.4601        -           <.1          >10X DECREASE
531.811      64.559         -           <.1          >10X DECREASE

END OF FILE
```

```
                TIME SERIES FLAG PROGRAM

           STATION 07 OYSTERS   WINDOW = 1.5

           CONCENTRATION  (ppb)
AV ARI     SPRING         FALL            RATIO         FLAG

191.112    165.688        -               <.1           >10% DECREASE
251.392    132.749        -               <.1           >10% DECREASE
254.933    -              70.0338         >70           ** NEW CPD
277.3      -              159.052         >159          ** NEW CPD

END OF FILE
```

```
                TIME SERIES FLAG PROGRAM

            STATION 08 OYSTERS   WINDOW = 1.5

            CONCENTRATION  (ppb)
AV ARI      SPRING         FALL          RATIO         FLAG

END OF FILE
```

```
              TIME SERIES FLAG PROGRAM

          STATION 09 OYSTERS   WINDOW = 1.5

          CONCENTRATION  (ppb)
AV ARI    SPRING         FALL          RATIO         FLAG

164.646   53.4698        -             <.1           >10X DECREASE
255.471   -              50.9173       >50           ** NEW CPD
277.447   -              180.294       >180          ** NEW CPD
438.35    50.0888        -             <.1           >10X DECREASE
485.396   56.7748        -             <.1           >10X DECREASE
532.422   59.0948        -             <.1           >10X DECREASE

END OF FILE
```

```
                 TIME SERIES FLAG PROGRAM

              STATION 10 OYSTERS   WINDOW = 1.5

AV ARI        CONCENTRATION  (ppb)
              SPRING         FALL          RATIO        FLAG

138.14        144.484        -
158.908       55.624         -             <.1          >10X DECREASE
265.201       72.8197        -             <.1          >10X DECREASE
505.24        -                            <.1          >10X DECREASE
572.558                      70.8346       >70          ** NEW CPD
              103.373        -             <.1          >10X DECREASE

END OF FILE
```

```
                     TIME SERIES FLAG PROGRAM

              STATION 11 OYSTERS   WINDOW = 1.5

              CONCENTRATION  (ppb)
AV ARI        SPRING         FALL          RATIO         FLAG

157.95        86.4326        -             <.1           >10X DECREASE
255.238       -              55.2698       >55           ** NEW CPD
277.324       -              169.491       >169          ** NEW CPD
327.563       52.6974        -             <.1           >10X DECREASE
359.602       59.229         -             <.1           >10X DECREASE
384.537       50.9186        -             <.1           >10X DECREASE
387.295       103.243        -             <.1           >10X DECREASE
413.467       137.185        -             <.1           >10X DECREASE
438.147       169.091        -             <.1           >10X DECREASE
462.053       199.1          -             <.1           >10X DECREASE
485.212       196.36         -             <.1           >10X DECREASE
532.295       188.532        -             <.1           >10X DECREASE

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

                 STATION 12 OYSTERS   WINDOW = 1.5

          CONCENTRATION  (ppb)
AV ARI    SPRING         FALL          RATIO         FLAG

531.843   62.3726        -             <.1           >10% DECREASE

END OF FILE
```

```
                  TIME SERIES FLAG PROGRAM

              STATION 13 OYSTERS   WINDOW = 1.5

                CONCENTRATION  (ppb)
AV ARI          SPRING         FALL          RATIO        FLAG

255.118         -              50.9797       >50          ** NEW CPD
386.733         150.296        -             <.1          >10X DECREASE
412.967         187.881        -             <.1          >10X DECREASE
437.449         210.182        -             <.1          >10X DECREASE
461.389         196.415        -             <.1          >10X DECREASE
484.583         179.476        -             <.1          >10X DECREASE
532.079         162.181        -             <.1          >10X DECREASE

END OF FILE
```

```
                 TIME SERIES FLAG PROGRAM

             STATION 14 OYSTERS   WINDOW = 1.5

AV ARI       CONCENTRATION  (ppb)
             SPRING         FALL         RATIO       FLAG

255.411      -              75.1441      >75         ** NEW CPD
277.634      -              53.8855      >53         ** NEW CPD
533.031      57.4857        -            <.1         >10X DECREASE

END OF FILE
```

```
                 TIME SERIES FLAG PROGRAM

            STATION 15 OYSTERS   WINDOW = 1.5

            CONCENTRATION  (ppb)
AV ARI      SPRING         FALL          RATIO         FLAG

255.301     -              86.3418       >86           ** NEW CPD

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

                STATION 16 OYSTERS   WINDOW = 1.5

                CONCENTRATION  (ppb)
AV ARI          SPRING         FALL           RATIO          FLAG


END OF FILE
```

```
                  TIME SERIES FLAG PROGRAM

              STATION 17 OYSTERS   WINDOW = 1.5

              CONCENTRATION  (ppb)
AV ARI        SPRING         FALL          RATIO          FLAG

483.504       64.2575        -             <.1            >10X DECREASE
531.682       100.499        -             <.1            >10X DECREASE
561.498       82.3           -             <.1            >10X DECREASE

END OF FILE
```

```
                 TIME SERIES FLAG PROGRAM

           STATION 18 OYSTERS   WINDOW = 1.5

           CONCENTRATION  (ppb)
AV ARI     SPRING         FALL          RATIO         FLAG

139.087    -              212.906       >212          ** NEW CPD
254.357    -              73.9355       >73           ** NEW CPD
425.748    57.6933        -             <.1           >10X DECREASE
490.459    93.7458        -             <.1           >10X DECREASE
531.941    59.1013        -             <.1           >10X DECREASE

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

                STATION 19 OYSTERS   WINDOW = 1.5

                CONCENTRATION  (ppb)
AV ARI          SPRING         FALL            RATIO          FLAG

139.283         261.614        15.5605         <.1            >10X DECREASE
462.13          61.0146        -               <.1            >10X DECREASE
485.179         69.5357        -               <.1            >10X DECREASE
532.296         75.1826        -               <.1            >10X DECREASE

END OF FILE
```

```
             TIME SERIES FLAG PROGRAM

           STATION 20 OYSTERS   WINDOW = 1.5

AV ARI     CONCENTRATION  (ppb)
           SPRING         FALL         RATIO        FLAG

140.964    51.5981        -            <.1          >10X DECREASE
392.555    -              52.1386      >52          ** NEW CPD
495.365    -              50.0877      >50          ** NEW CPD
519.099    -              88.0041      >88          ** NEW CPD
542.182    -              83.4657      >83          ** NEW CPD
564.842    -              76.9059      >76          ** NEW CPD
592.16     -              70.2812      >70          ** NEW CPD

END OF FILE
```

```
              TIME SERIES FLAG PROGRAM

          STATION 21 OYSTERS   WINDOW = 1.5

          CONCENTRATION  (ppb)
AV ARI    SPRING         FALL         RATIO        FLAG

137.524   -              54.0427      >54          ** NEW CPD
253.332   -              58.9127      >58          ** NEW CPD
392.926   -              72.0479      >72          ** NEW CPD

END OF FILE
```

```
                TIME SERIES FLAG PROGRAM

           STATION 22 OYSTERS   WINDOW = 1.5

AV ARI     CONCENTRATION  (ppb)
           SPRING         FALL       RATIO      FLAG

101.403    -              65.7244    >65        ** NEW CPD
107.35     -              56.0716    >56        ** NEW CPD
139.405    104.834        -          <.1        >10X DECREASE
254.061    -              50.2974    >50        ** NEW CPD
283.282    -              71.7267    >71        ** NEW CPD
285.161    63.2255        -          <.1        >10X DECREASE
366.654    -              59.9548    >59        ** NEW CPD
392.547    -              54.5296    >54        ** NEW CPD

END OF FILE
```

```
                    TIME SERIES FLAG PROGRAM

                 STATION 23 OYSTERS   WINDOW = 1.5

                 CONCENTRATION  (ppb)
AV ARI           SPRING         FALL          RATIO         FLAG

END OF FILE
```

APPENDIX VIII

Determination of volatile halogenated organic compounds in the water column.

SAMPLE COLLECTION AND LOCATION

A "Kemmerer" bottle, made of a brass tube that can be opened and closed at both ends was selected. Water samples, after addition of sodium thiosulfate were stored in Pyrex tubes with Teflon-lined screw caps and kept on ice while in the field and at 4°C in the laboratory until analyzed. The Pyrex tubes were soaked in Chem-Solv, rinsed with deionized water and acetone, and baked at 400°C for three hours.

The sample locations can be divided into three groups: (a) those lying within major river mouths draining into the Chesapeake Bay, (b) those located along the James River, and (c) those near suspected point sources of volatile halogenated organic compounds (VHO), i.e. power plants, sewage treatment plants and industrial discharges. During the first cruise, group (a) was collected with a commercial oyster boat, group (b) with a boat of the Thunderbird type and group (c) with a boat of the Zodiac type.

From experience it was determined that the Zodiac boat type was best suited to collect sample groups (a) and (c) and the Thunderbird type for sample group (b) to achieve necessary mobility and economy. Two not originally planned stations at the discharge sites of the Potomac Electric Power Co. Plant at Morgantown (PEPCO) and the Virginia Electric Power Co. Plant at Yorktown (VEPCO) were added to group (c). Due to bad weather and lack of boat time, group (b) was eliminated for the third cruise and will be retaken at a later time. Detailed information regarding locations and sampling dates are listed in Table A and Figure A.

STANDARDS AND SOLVENT

High purity standards of chloroform, carbon tetrachloride, 1,1,1-trichloroethane, trichloroethylene, bromodichloromethane, tetrachloroethylene and bromoform were obtained from Aldrich. Dibromochloromethane was obtained from RFR Corp. Methanol, used as solvent, was purchased from B & J Co. Mixed standards of VHO compounds prepared in methanol were used to obtain calibration curves. Standards were used to check the daily performance of gas chromatograph. In addition, deep well water was used for routine blank tests.

ANALYTICAL METHOD

A Varian 2700 GC equipped with an FID, a ScH^3 ECD and a homemade glass/platinum effluent splitter analogous to that of Etzweiter Neuner and Jehle (1973) was used. The conventional injector was replaced with a Grob injector. Nitrogen gas served as carrier and make-up gas.

A Sparging Concentrator (STC) (Chemical Data System, Model 310-011) was incorporated in the injector end of the GC. A syringe needle (Precision Co. Cat. No. 123050) was used to connect the exit port of STC to the GC injector port.

The VHO's in water samples were concentrated by purging with nitrogen gas and trapping on Tenax. Nitrogen gas was prepurified by drierite, molecular sieve 5A and Tenax. After fifteen minutes of purging, the trap was heated to 250°C and the VHO's transferred to the injector port.

All samples were analyzed on a wall coated 44 M x 0.3 mm ID Pyrex glass capillary column containing SE 52 as the liquid phase (Grob 1977). Temperature programming was started at 42°C, held isothermal for two minutes then programmed to 115°C at a rate of 6°C/min.

Sample peaks were identified by a HP 3354 Laboratory Automation System by comparison of retention times with those in standards.

RECOVERY YIELD

Deep well water spiked with the standard mixture was used to check the recovery of the system. The results are listed in Table B. Agreement with yields reported by EPA (1977) is fair.

RESULTS AND DISCUSSIONS

Volatile halogenated organic compounds identified include chloroform, 1,1,1-trichloromethane, carbon tetrachloride, trichloroethylene, bromodichloromethane dibromochloromethane, tetrachloroethylene and bromoform. The concentrations of these VHO's did not vary significantly with respect to sampling time and locations, except in samples taken near outfalls of sewage treatment plants or power plants. The results of the first three cruises are listed in Table C.

High concentrations of chloroform were found in some samples collected during the first cruise (Stations 14, 22 and 23). After comparing these data with those from the second and third sets, we suspect that the high concentrations of chloroform encountered in these samples probably were caused by sample contamination.

In general, samples collected along James River indicated individual compound concentrations less than 0.1 ppb. However, chloroform and trichloroethane concentrations as high as 0.6 ppb and 0.7 ppb respectively have been observed. The highest concentrations of chloroform were found near the Hampton Roads Sanitary District's sewage treatment plant outfall.

Samples collected at river mouths (St. 05, 08, 11, 14 and S1) also showed concentrations of VHO compounds of less than 0.1 ppb. However, high concentrations of bromoform were observed near the York River mouth (0.3 - 0.6 ppb) and near the VEPCO Yorktown Plant outfall (0.52 - 0.63 ppb) indicating that the effluent from this power plant leads to significant amounts of bromoform in the river.

Samples collected in the Baltimore Channel (St. 22 and 23) show medium concentrations of VHO compounds. 1,1,1-Trichloroethane, trichloroethylene and tetrachloroethylene were generally higher than those collected along the James River and at river mouths. These compounds are commonly used as solvents in industrial processes.

Figures B and C show gas chromatograms of samples collected at Potomac River Bridge at Hwy 301 (St. P2) and the Blue Plains Sewage Treatment Plant (St. P3). It is noted that the major compounds in the PEPCO sample are brominated hydrocarbons, while the St. P3 sample is dominated by chlorinated hydrocarbons. It is well known that chloroform is formed during chlorination of drinking water, wastewater and cooling water of power plants (R. L. Jolley, 1976). Bromide ion in estuarine waters can be oxidized by hypochlorite ion to bromine, hypobromite ion and hypobromic acid which then reacts with organic compounds. Thus, in the presence of bromide ion, other VHO compounds such as bromodichloromethane, dibromochloromethane and bromoform are also formed. This is indicated by our data. The main reason for the existence of two different kinds of halogenated organic compounds in PEPCO and Blue Plains samples could be understood by a lesser amount of bromide ion present at the Blue Plains site. Also, most chlorine in a sewage plant is converted to chloromines due to the high NH_3-NH_4^+ in sewage. Major VHO compounds are chloroform, trichloroethylene, bromodichloromethane and tetrachloroethylene. Trichloroethylene and tetrachloroethylene are common solvents used for industrial and household cleaning purposes.

The first and second sample at station P2 were collected at or near high tide while the third was taken near low tide. Because station P2 was located upstream of the PEPCO discharge site, it is anticipated that the concentrations of VHO compounds in the first and second sample would be higher than those in the third sample. In general this trend is followed. However, an extremely high concentration of bromoform (7.2 ppb) was observed in the second sample, which was consistent with a high concentration of bromoform (86 ppb) found in a sample collected at the PEPCO discharge site during the same cruise. Obviously, high concentrations of VHO compounds in station P2 are related to the source at the PEPCO site.

Samples collected at the Blue Plains site show less variation with respect to sampling time. The samples of the first two cruises were collected near low tide. Because of a dilution effect expected for high tide, the concentrations of VHO compounds in samples from the third cruise were generally lower than those in the first two.

Samples collected at West Point (St. Y1) did not show significant amounts of VHO compounds, although pulp and paper mill wastewater was discharged near this site. The pulp and paper mill wastewater was treated by high purity oxygen activated sludge process patented by Union Carbide (unor process). It is believed that high effluent temperature and air stripping might remove VHO compounds in this wastewater.

TABLE A. Locations and Sampling Dates of Water Samples

Station	Sampling Date Cruise 1	 Cruise 2	 Cruise 3	Location
05	4- 9-79	8-10-79	9-11-79	York River Mouth near Tue light (cruise 1) near black buoy 32 (cruise 2&3)
08	4- 9-79	8- 8-79	9-11-79	Rappahannock River mouth near light "7" (cruise 1) Middle of Rappahannock Bridge (cruise 2&3)
11	4-18-79	8- 8-79	9-12-79	Potomac River mouth 1/2 way between Pt. Lookout & Cornfield Pt. (cruise 1) near Pt. Lookout light (cruise 2&3)
14	4-18-79	8- 8-79	9-12-79	Patuxent River mouth near Solomons Is. (cruise 1) near Biology Dept. of U.Md. at Solomons (cruise 2&3)
22	4-19-79	8- 9-79	9-13-79	Baltimore Harbor Off Bodkin Pt. red buoy 14C (cruise 1) 1/2 way between Ft. Smallwood & Baltimore Channel (cruise 2&3)
23	4-19-79	8- 9-79	9-13-79	Baltimore Channel Jct. buoy red 2B (cruise 1) near Ft. Carroll (cruise 2&3)
J1	6-14-79	7-31-79		James River near Surry Power Plant outfall
J3	6-14-79	7-13-79		James River Deep Creek mouth between R "8" and R "10"
J4	6-14-79	7-31-79		James River Pagan River mouth, R daymark #14
J6	6-14-79	7-31-79		James River Nansemond River mouth B & W "N2"
J7	6-14-79	7-31-79		James River Hampton Road Tunnel

TABLE A. Locations and Sampling Dates of Water Samples (cont.)

Station	Sampling Date Cruise 1	 Cruise 2	 Cruise 3	Location
P2	6-27-79	8- 8-79	9-12-79	Potomac River the third piling of Potomac River bridge from Maryland side
P3	6-28-79	8- 9-79	9-13-79	Potomac River near outfall of Wash., D.C. Sewage Treatment Plant (Blue Plain)
Y1	6-29-79	8-10-79	9-10-79	York River Jct. of York River and Mattaponi River
S1	6-27-79	8- 9-79	9-12-79	Susquehanna River near river mouth underneath railway bridge

TABLE B

Trapping Efficiency of STC

Compounds	% Recovery Yield
Chloroform	88.1
1,1,1-Trichloroethane	100
Carbon Tetrachloride	92.3
Trichloroethylene	87.8
Bromodichloromethane	89.3
Dibromechloromethane	85.5
Tetrachloroethylene	92.7
Bromoform	74

TABLE C

The Concentrations (ppb) of Volatile Halogenated Organic Compounds in Water Samples

COMPOUND	STATION (Group a)						
	05	08	11	14	22	23	S1
				CRUISE 1			
$CHCl_3$	0.65	2.96	1.67	>7	>3	>7	0.07
CH_3CCl_3	0.1	0.03	0.22	1.6	0.22	2.3	0.51
CCl_4	<0.01	-	-	-	-	0.03	<0.01
$CHCl{=}CCl_2$	0.02	<0.01	0.07	0.04	0.02	2.53	0.01
$CHBrCl_2$	0.03	<0.01	<0.01		0.02	0.5	<0.01
$CHBr_2Cl$	0.01	<0.01	0.03	0.1	<0.01	2.4	-
$CCl_2{=}CCl_2$	0.04	<0.01	<0.01	0.03	<0.01	0.04	<0.01
$CHBr_3$	0.13	0.03	0.06	0.08	0.06	9.0	<0.01

TABLE C
(Continued)

COMPOUND	STATION (Group a)						
	05	08	11	14	22	33	S1
CRUISE 2							
$CHCl_3$	0.09	2.6	0.06	0.08	0.19	0.48	0.08
CH_3CCl_3	0.1	1.95	0.54	0.48	0.92	1.10	0.92
CCl_4	<0.01	-	-	-	0.03	0.06	-
$CHCl=CCl_2$		-	-	-	0.12	0.19	0.04
$CHBrCl_2$	0.09	-	0.01	0.03	0.13	0.09	<0.01
$CHBr_2Cl$	0.02	0.01	0.02	-	0.04	0.02	<0.01
$CCl_2=CCl_2$	<0.01	0.04	-	0.03	0.24	0.59	0.03
$CHBr_3$	0.63	0.03	-		0.26	0.09	0.02

TABLE C
(Continued)

COMPOUND	STATION (Group a)						
	05	08	11	14	22	33	S1
				CRUISE 3			
$CHCl_3$	0.02	0.01	0.03	0.01	0.07	0.16	0.03
CH_3CCl_3	0.17	0.06	0.08	0.12	0.40	1.7	0.08
CCl_4	<0.01	<0.01	<0.01	0.02	0.02	0.05	<0.01
$CHCl=CCl_2$	<0.01	<0.01	-	-	0.15	0.54	0.02
$CHBrCl_2$	0.05	0.05	0.02	0.02	0.04	0.16	-
CHBrCl	0.02	<0.01	-	-	0.02	0.08	-
$CCl_2=CCl_2$	-	-	-	-	0.1	0.32	-
$CHBr_3$	0.30	0.03	0.03	0.02	0.03	0.22	-

TABLE C
(Continued)

COMPOUND	STATION (Group b)				
	J1	J3	J4	J6	J7
		CRUISE 1			
$CHCl_3$	0.08	0.21	0.11	0.01	0.02
CH_3CCl_3	0.37	0.04	-	0.04	0.02
CCl_4	<0.01	<0.01	<0.01	<0.01	<0.01
$CHCl=CCl_2$	0.04	0.04	0.06	<0.01	<0.01
$CHBrCl_2$	-	<0.01	<0.01	<0.01	<0.01
$CHBr_2Cl$	-	<0.01	0.02	<0.01	-
$CCl_2=CCl_2$	<0.01	<0.01	0.02	0.04	0.04
$CHBr_3$	0.02	0.02	0.02	0.01	0.02

TABLE C
(Continued)

COMPOUND	STATION (Group b)				
	J1	J3	J4	J6	J7
			CRUISE 2		
$CHCl_3$	0.17	0.62	0.15	0.05	0.55
CH_3CCl_3	0.73	0.49	0.52	0.39	0.42
CCl_4	-	<0.01	<0.01	<0.01	<0.01
$CHCl=CCl_2$	-	<0.01	<0.01	<0.01	<0.01
$CHBrCl_2$	-	<0.01	-	<0.01	<0.01
$CHBr_2Cl$	-	<0.01	-	-	-
$CCl_2=CCl_2$	0.07	0.19	0.07	0.09	0.04
$CHBr_3$	-	-	-	-	<0.01

TABLE C
(Continued)

COMPOUND	STATION (Group c)		
	P2	P3	Y1
	CRUISE 1		
$CHCl_3$	0.1	>14	0.42
CH_3CCl_3	0.34	1.58	0.02
CCl_4	<0.01	0.12	<0.01
$CHCl=CCl_2$	0.01	0.98	0.03
$CHBrCl_2$	0.06	>4	0.03
$CHBr_2Cl$	0.88	1.68	0.04
$CCl_2=CCl_2$	<0.01	>4	0.03
$CHBr_3$	0.96	0.38	0.09

TABLE C
(Continued)

COMPOUND	STATION (Group c)		
	P2	P3	Y1
		CRUISE 2	
$CHCl_3$	2.8	12.6	0.92
CH_3CCl_3	0.8	1.1	0.08
CCl_4	-	0.07	
$CHCl=CCl_2$	-	0.4	<0.01
$CHBrCl_2$	0.6	1.07	0.02
$CHBr_2Cl$	0.5	0.16	<0.01
$CCl_2=CCl_2$	0.2	2.2	0.04
$CHBr_3$	7.2	0.4	-

TABLE C
(Continued)

COMPOUND	STATION (Group c)	
	PEPCO Outfall	VEPCO Outfall
	CRUISE 2	
$CHCl_3$	1.0	0.34
CH_3CCl_3	0.8	0.1
CCl_4	-	<0.1
$CHCl=CCl_2$	-	<0.1
$CHBrCl_2$	0.44	0.1
$CHBr_2Cl$	0.72	0.02
$CCl_2=CCl_2$	0.2	0.01
$CHBr_3$	8.6	0.52

TABLE C
(Continued)

COMPOUND	STATION (Group c)	
	PEPCO Outfall	VEPCO Outfall
	CRUISE 3	
$CHCl_3$	0.06	0.25
CH_3CCl_3	0.1	0.55
CCl_4	0.01	0.1
$CHCl=CCl_2$	-	0.5
$CHBrCl_2$	0.20	-
$CHBr_2Cl$	0.9	0.2
$CCl_2=CCl_2$	-	0.15
$CHBr_3$	2.5	0.75

TABLE C
(Continued)

COMPOUND	STATION (Group c)		
	P2	P3	Y1
	CRUISE 3		
$CHCl_3$	0.05	4.3	0.07
CH_3CCl_3	0.16	0.68	0.01
CCl_4	0.03	0.25	<0.01
$CHCl=CCl_2$	0.01	0.05	<0.01
$CHBrCl_2$	0.04	0.40	-
$CHBr_2Cl$	0.14	0.08	<0.01
$CCl_2=CCl_2$	0.01	0.95	-
$CHBr_3$	0.28	0.1	-

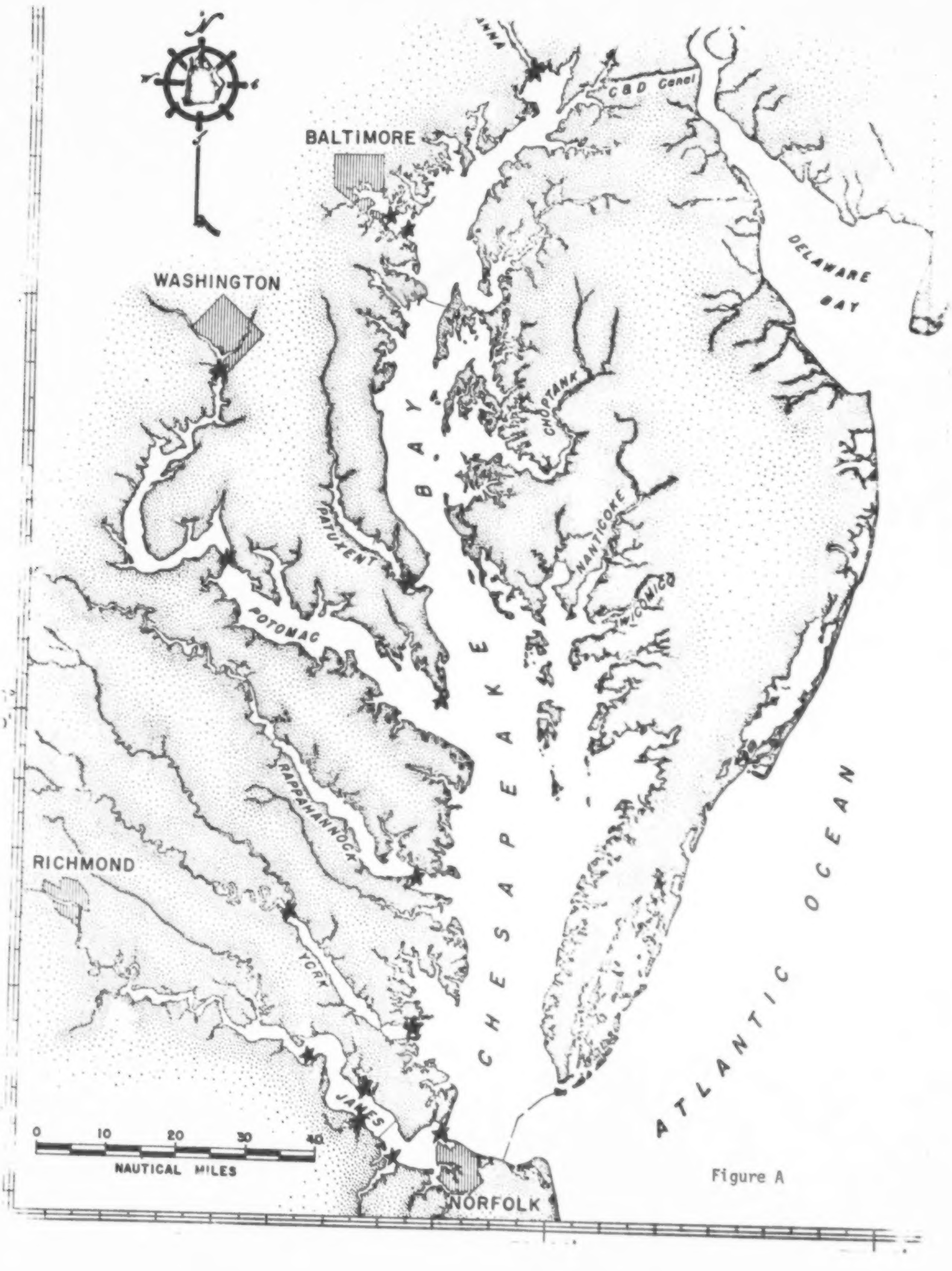

BALTIMORE
C&D Canal
WASHINGTON
DELAWARE BAY
CHOPTANK
BAY
PATUXENT
NANTICOKE
WICOMICO
POTOMAC
CHESAPEAKE
RAPPAHANNOCK
RICHMOND
YORK
ATLANTIC OCEAN
JAMES
0 10 20 30 40
NAUTICAL MILES
NORFOLK

Figure A

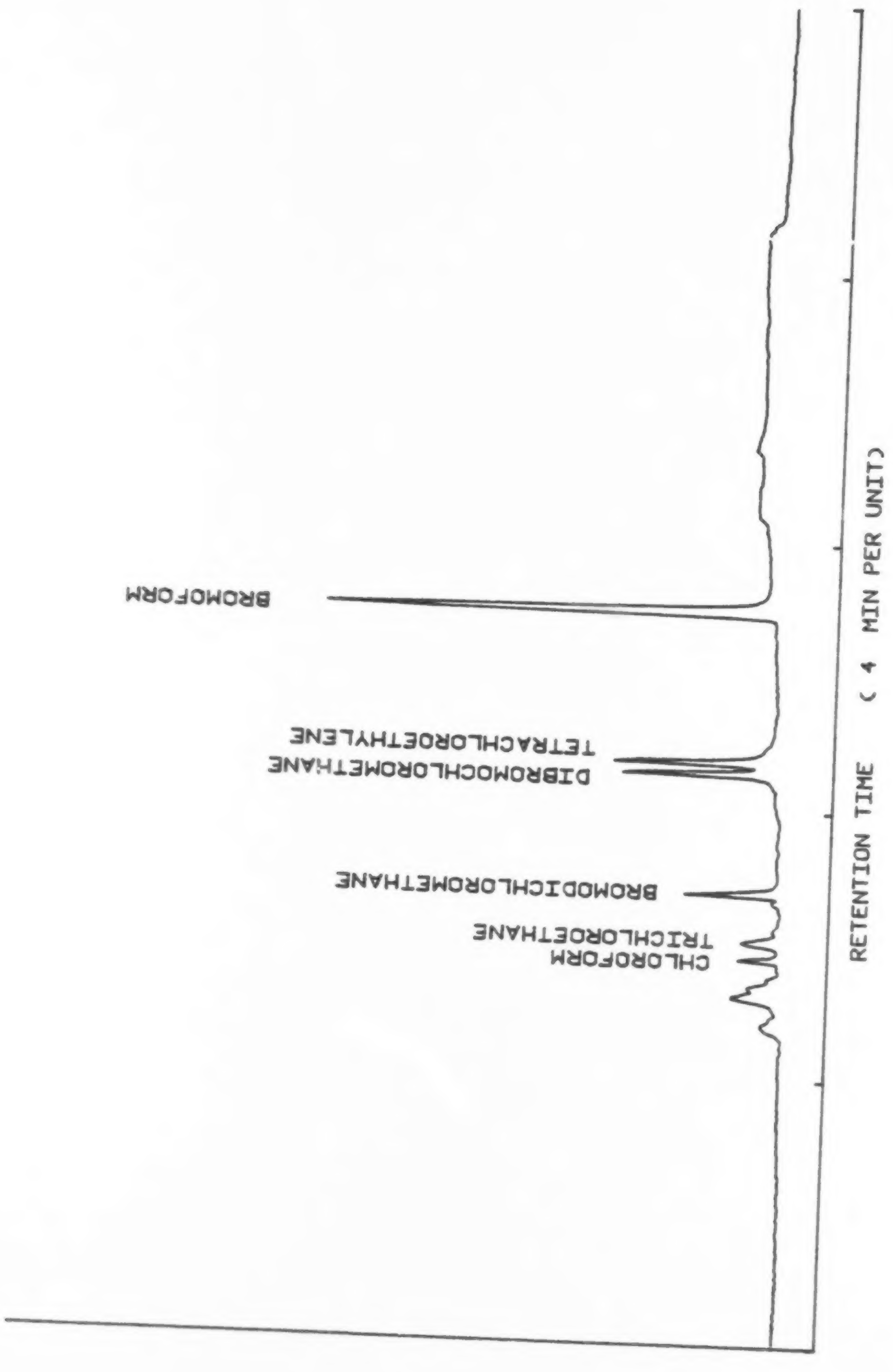

CHLOROFORM
TRICHLOROETHANE
BROMODICHLOROMETHANE
DIBROMOCHLOROMETHANE
TETRACHLOROETHYLENE
BROMOFORM
RETENTION TIME (4 MIN PER UNIT)

Figure B

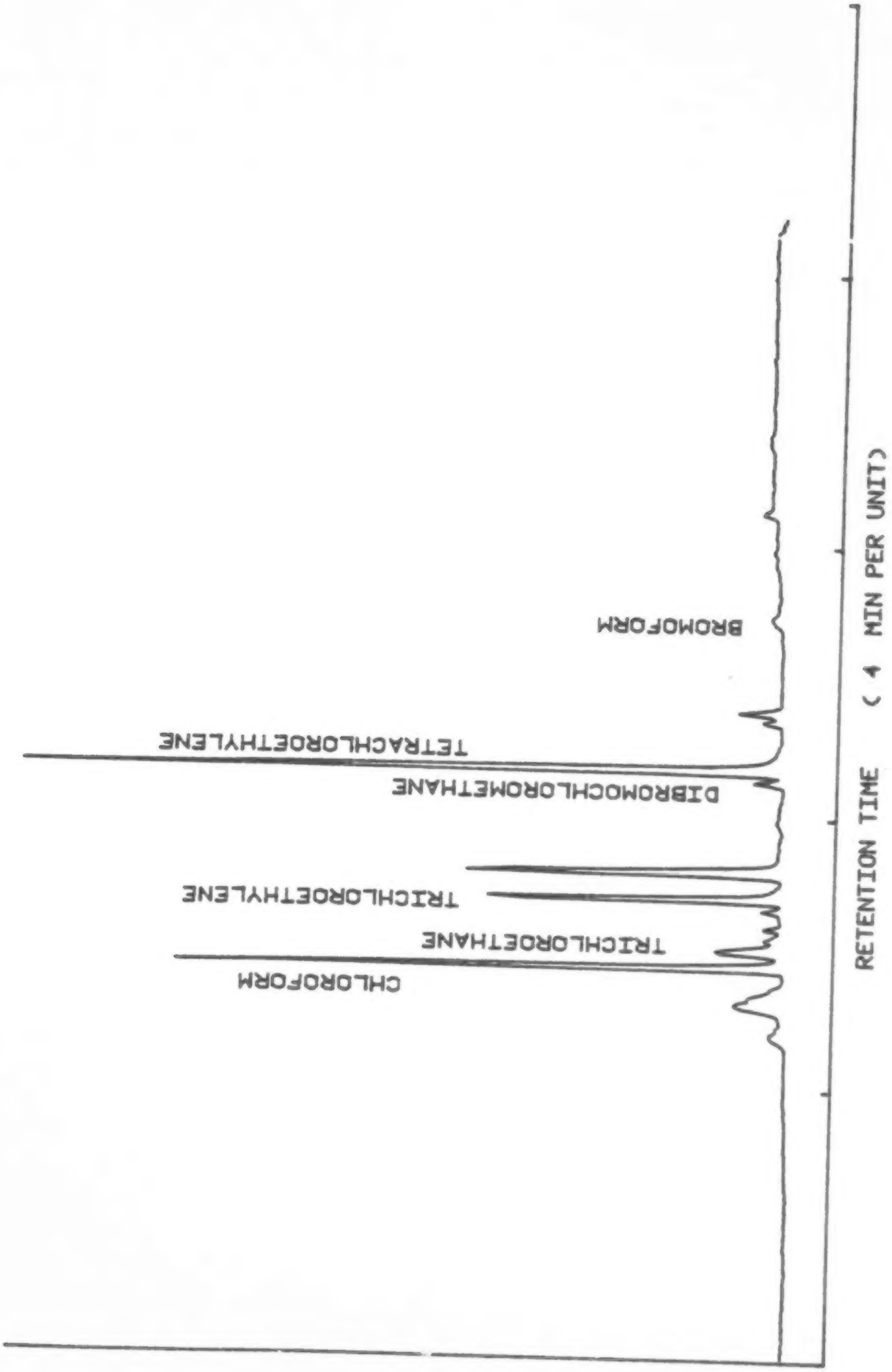

CHLOROFORM
TRICHLOROETHANE
TRICHLOROETHYLENE
DIBROMOCHLOROMETHANE
TETRACHLOROETHYLENE
BROMOFORM
RETENTION TIME (4 MIN PER UNIT)

Figure C